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NATIONAL DAM INSPECTION PROGRAM. TARSNEY LAKE DAM (MO 20136), T--ETC(U)
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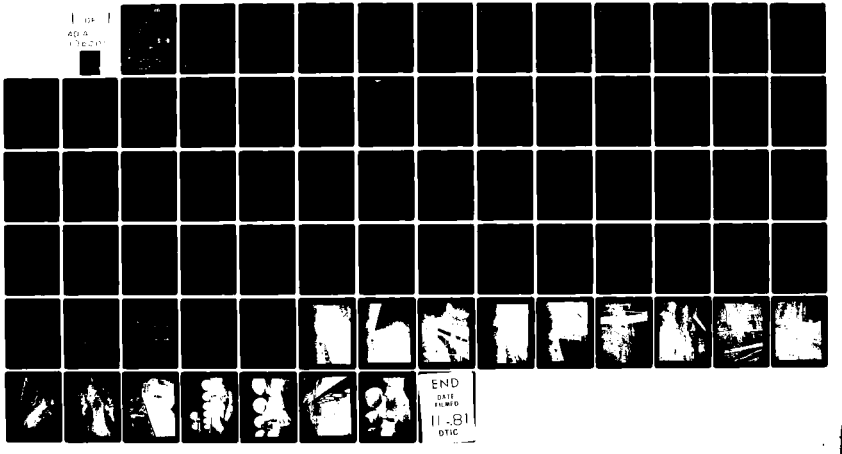

LEVEL II

1

PHASE I REPORT

NATIONAL DAM INSPECTION PROGRAM

TARSNEY LAKE DAM - MO 20136
TRIBUTARY OF SNI-A-BAR CREEK
JACKSON COUNTY, MISSOURI

DEPARTMENT OF THE ARMY
KANSAS CITY DISTRICT, CORPS OF ENGINEERS

AUGUST 1978

UNCLASSIFIED

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1. REPORT NUMBER	2. GOVT ACCESSION NO. 3. RECIPIENT'S CATALOG NUMBER
	MO-A206
4. TITLE (and Subtitle) Phase I Dam Inspection Report National Dam Safety Program Tarsney Lake Dam (MO 20136) Jackson County, Missouri	5. TYPE OF REPORT & PERIOD COVERED Final Report 6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s) Corps of Engineers, Memphis District	8. CONTRACT OR GRANT NUMBER(s) N/A
9. PERFORMING ORGANIZATION NAME AND ADDRESS U.S. Army Engineer District, St. Louis Dam Inventory and Inspection Section, LMSED-PD 210 Tucker Blvd., North, St. Louis, Mo. 63101	10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
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14. MONITORING AGENCY NAME & ADDRESS(if different from Controlling Office)	15. SECURITY CLASS. (of this report) UNCLASSIFIED 15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT (of this Report)

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18. SUPPLEMENTARY NOTES

National Dam Inspection Program. Tarsney Lake Dam (MO 20136), Tributary of Sni-A-Bar Creek, Jackson County, Missouri. Phase I Inspection Report.

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Dam Safety, Lake, Dam Inspection, Private Dams

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

This report was prepared under the National Program of Inspection of Non-Federal Dams. This report assesses the general condition of the dam with respect to safety, based on available data and on visual inspection, to determine if the dam poses hazards to human life or property.

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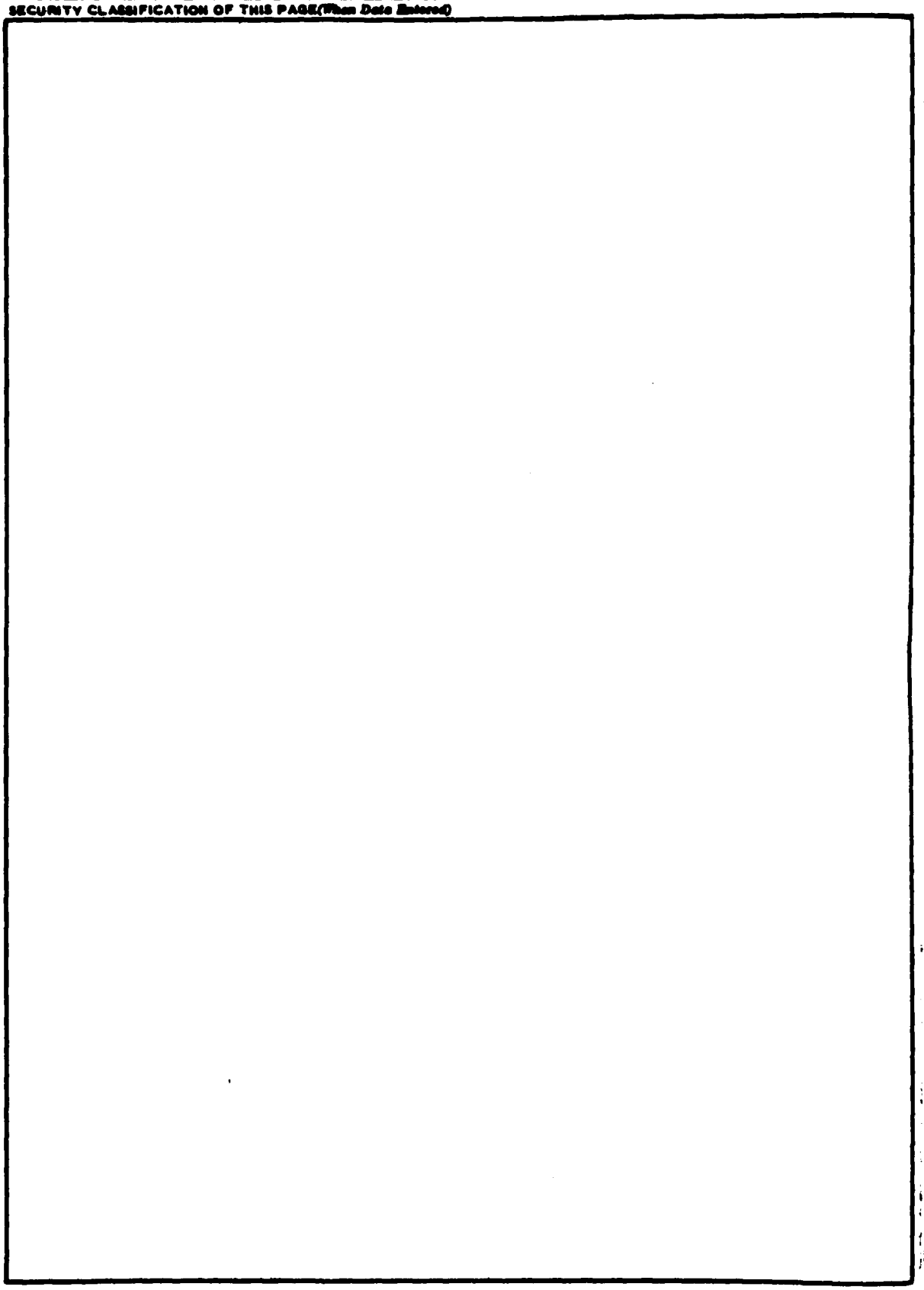

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☆ U.S. G.P.O. 1980-665-141/1299

DEPARTMENT OF THE ARMY
ST. LOUIS DISTRICT, CORPS OF ENGINEERS
210 NORTH 12TH STREET
ST. LOUIS, MISSOURI 63101

IN REPLY REFER TO

SUBJECT: Tarsney Lake Dam (Mo. 20136) Phase I Inspection Report

This report presents the results of field inspection and evaluation of the Tarsney Lake Dam (Mo. 20136):

It was prepared under the National Program of Inspection of Non-Federal Dams.

This dam has been classified as unsafe, non-emergency by the St. Louis District as a result of the following deficiencies:

Hydraulic/Hydrologic

1) Spillway will not pass 50 percent of the Probable Maximum Flood.

2) Overtopping could result in dam failure.

3) Dam failure significantly increases the hazard to loss of life downstream.

Stability

1) Piping under the spillway.

2) Excessively steep downstream slope.

SUBMITTED BY: SIGNED
Chief, Engineering Division

26 SEP 1978
Date

APPROVED BY: SIGNED
Colonel, CE, District Engineer

27 SEP 1978
Date

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GLOSSARY OF ABBREVIATIONS AND TERMS USED IN REPORT
(also see Sketch Plan and Profile)

Acre-Feet - The amount of water in, or equal to, one surface acre with one foot depth = 325,900 gallons (43,560 cu. ft.)

Abut. - Abutment - The valley walls, or an adjacent structure, against which the embankment (dam) is constructed.

Bedrock - All in-place rock, to include shale, sandstone and limestone.

Berm - A bench or flat area on an embankment slope. Usually slightly sloping, for drainage.

BM - Benchmark - A permanent reference marker, usually in metal or concrete, used for survey elevation and/or location. (TBM = Temporary Benchmark)

CFS - Cubic feet per second, flow rate. One CFS = 449 gpm

CIP - Cast-iron pipe.

CMP - Corrugated metal pipe

Conduit - A pipe or tube used to convey water, usually thru the embankment. Normally part of outlet works, between inlet and outlet.

Controlled - An outlet works or spillway structure having a gate or valve to vary the flow rate or depth (spillway gate).

Crest - The top of the embankment. Also, the highest plane or line across the spillway floor (usually the sill).

DS - Downstream - In direction of flow, below crest of dam or spillway.

Embankment - The earth or rockfill dam, or diversion structure.

Freeboard - The vertical distance between design maximum water level and top of dam.

Grout - A fluid mixture, usually cement and water, used to fill voids (cracks) in rock to reduce or stop seepage.

Headwall - A vertical wall over a conduit. Usually for erosion protection and stability. Either upstream or downstream end.

(H) - Horizontal distance (used on slope designation)

Inlet - The part of a structure, or channel, where water enters (from the lake). Also referred to as intake or orfice.

Invert - The bottom of a conduit.

KCD - Kansas City District, Corps of Engineers

KSDOT - Kansas Department of Transportation (State Highway Dept).

Lt - Left - As viewed looking downstream.

L - Length - Distance along the top of dam, between abutments. Also, upstream to downstream distance for outlet works (conduit) or spillway.

Normal Pool - Lake level most of the time. Usually controlled by inlet of outlet works structure. If no outlet works, then would be spillway crest (sill).

Outlet - The part of a structure, or channel, where water discharges, such as the downstream end of a conduit or downstream of spillway sill (crest).

OW - Outlet Works - A water control structure, usually having three component parts; An inlet, conduit, and outlet. Controls lake level by means of raised inlet (riser pipe) or gates (valves).

Plunge Pool - A pool caused by water flowing out of a pipe (or chute) and eroding the soil or rock below the end of the pipe.

PMF - Probable Maximum Flood.

RCP - Reinforced concrete pipe.

Rt - Right - As viewed looking downstream.

Riprap - Rock, or other durable material, placed on slopes, banks, and channel floors to prevent erosion. Also called slope protection or stone protection.

Seepage - A flow of water thru, around or under an embankment or other structure.

Sill - A structure to maintain a level flow in a channel.

Sinkhole - A hole on the ground surface caused by water dissolving rock or washing out soil, underground.

Spillway - A structure to prevent overtopping of the dam (if of adequate size). Usage designations are:

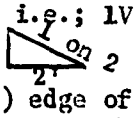
Service - Regularly controls all lake outflow, where there is no outlet works or when the OW gates are normally closed.

Limited Service - Controls lake outflow in excess of that released thru outlet works.

Emergency - A spillway, with higher crest than service or limited service, to control maximum flows.

SB - Stilling Basin - A sub-structure at the downstream end of the outlet works or spillway to dissipate the flow energy and reduce erosion.

Slope - The upstream and downstream face of the dam or channel floors and sides. Does not include walls, but may be paved or riprapped.

(Slope angle) - Designated as the vertical height versus the horizontal distance, i.e.; 1V on 2H = 1 ft. vertical and 2 ft. horizontal (1' 

Toe - The basal (downstream) edge of the embankment or other structure (sometimes used with heel to designate the upstream base edge).

Uncontrolled - An outlet works or spillway with no gates or valves.

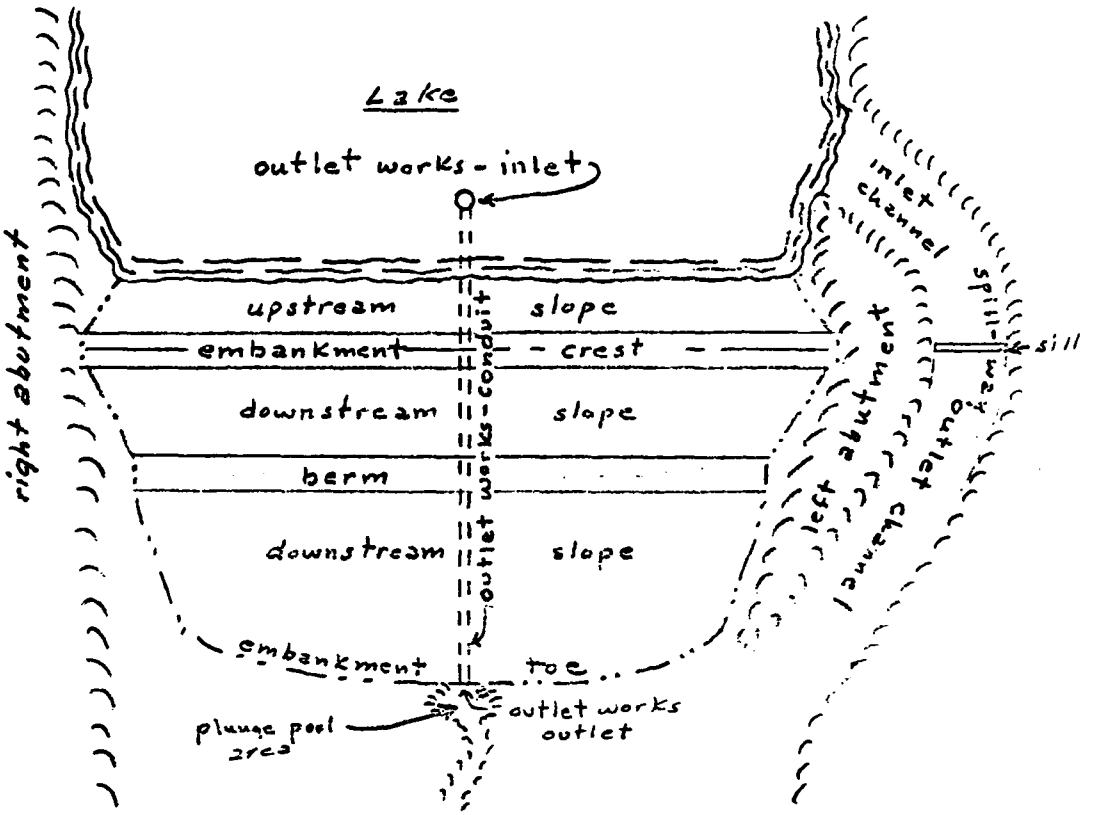
USCE - U.S. Army Corps of Engineers

W - Width - The upstream-downstream dimension of an embankment or the dimension across (perpendicular) a channel or conduit.

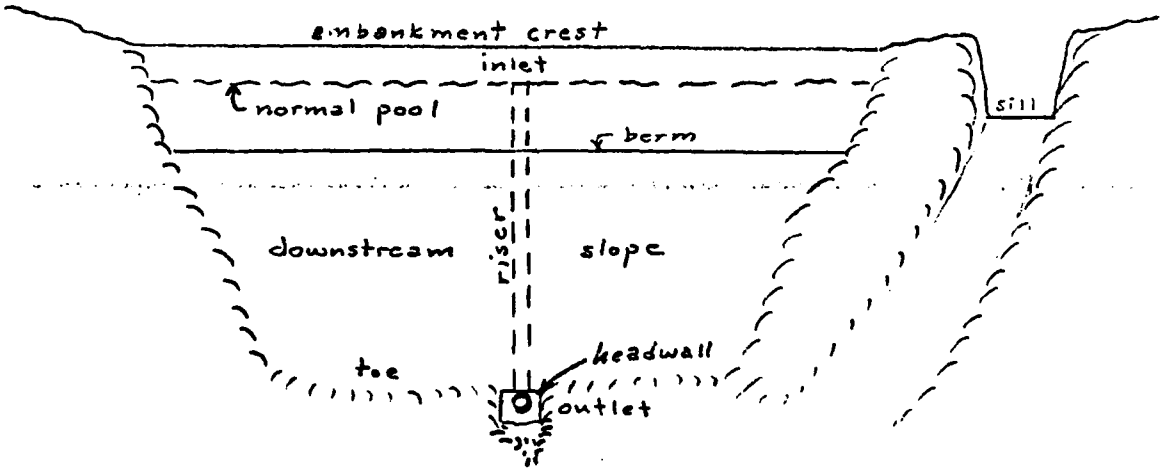
U. S. ARMY CORPS OF ENGINEERS - KANSAS CITY DISTRICT

Comp. By [illegible] Date 7-78 Project NATIONAL DAM INSPECTION Sheet ____ of ____

Chkd. By ____ Date ____ Subject Glossary Sheet ____ of ____



PLAN VIEW - LOOKING UPSTREAM



ELEVATION - LOOKING UPSTREAM

PHASE I REPORT
NATIONAL DAM INSPECTION PROGRAM
TARSNEY LAKE - MO 20136
JACKSON COUNTY, MISSOURI

1. Authority. The dam was inspected under provisions of the National Dam Inspection Act, Public Law 92-367, 8 August 1972, in accordance with guidelines prepared by the Department of the Army, Office of the Chief of Engineers.

2. Inspection. Tarsney Lake Dam was inspected on 11 April 1978, by personnel from the Kansas City District Office of the Corps of Engineers. This inspection was accomplished for the St. Louis District of the Corps of Engineers which has responsibility for the non-federal dam inspections in the State of Missouri. The dam inspection was not prescheduled but was undertaken because of a telephone call to the Kansas City District Office from a concerned resident downstream of the dam, indicating that the dam had developed serious problems.

3. Description of the Dam.

a. Owner. When the dam was inspected the legal owner of the dam was unknown. In the last several years the Homeowners Association, in cooperation with the Village of Tarsney Lakes, Missouri, had assumed responsibility for maintaining the dam. Subsequent to the inspection, it was determined that the legal owner was the Lake Development Co., Inc., Thomas F. Sotham, Jr. (President). Legal title has since been given to the Village of Tarsney Lakes.

b. Location. The dam is located on West Fork, a left bank tributary of Sni-A-Bar Creek in eastern Jackson County, Missouri (S.E. 1/4 Sec 22, R30W., T48N.).

c. General. The crest elevation is approximately 840 feet msl with a crown width of 15 feet and a crest length of approximately 700 feet. The lake has approximately 17.5 surface acres at normal pool. A service spillway is located on the right (East) abutment.

d. History. According to residents, the dam was constructed in 1927 as a recreation lake. A box culvert on the left (West) abutment served as a limited service spillway until 1965, when a new spillway was constructed on the right (East) abutment. At this time (1965), the left abutment spillway was blocked with a masonry wall at the upstream end. An 8 inch pipe through the base of the dam, with a

valve on the downstream end, was installed to regulate the lake level and to minimize spillway flows. In 1976, the inlet to the pipe was blocked to facilitate replacement of the 8 inch valve on the outlet pipe. The inlet was blocked by divers using plastic garbage bags filled with sand. When the divers tried to remove the plug, one of the bags entered the pipe and effectively plugged the pipe. The new spillway outlet channel downstream of the right abutment spillway eroded and undercut the spillway apron slab which caused the apron slab to fail and leave the downstream end of the spillway CMP's unsupported. On the day of the inspection, 11 April 1978, water was flowing under the CMP's and actively eroding embankment material. Based on the field inspection, an emergency was declared and under Public Law - 99, the Kansas City District provided manpower, equipment, and technical assistance. The State of Missouri and Jackson County also rendered assistance. The immediate goal was to lower the lake level and stop the flows that were undermining the spillway and provide some storage capacity in the lake. During the evening of 11 April, and early morning of 12 April, 6 pumps were put in service and operated on a round-the-clock basis through the 14th of April. The lake was lowered several feet and sandbags were placed at the downstream end of the spillway in an effort to reinforce the spillway. In view of the uncertainties regarding ownership and responsibility for the remedial measures, the Kansas City District recommended the dam be breached and the lake drained until repairs were made, as the most positive means of preventing a dam failure. Since the road across the top of the dam provided the only access for approximately 200 residences on the east side of the lake, breaching the dam was not considered viable by local residents. When the immediate emergency was over, the Kansas City District removed its pumps and personnel. Subsequently, the local residents removed the masonry wall blocking the box culvert spillway and installed six four-inch siphons through the box culvert to further lower the lake level. The Village of Tarsney Lakes has applied for a grant from the Department of Housing and Urban Development in order to fund temporary repairs. As of 1 August 1978, no additional remedial work (temporary or permanent) had been accomplished.

e. Embankment. The embankment is an earth structure with a 15 foot wide crest and the height above the streambed is approximately 35 feet. The upstream slope is believed to be 1 vertical on 2 horizontal, while the downstream slope is approximately 1V on 1.25H.

f. Outlet Works. The outlet works consists of an 8 inch diameter cast iron pipe through the base of the dam. There is a control valve at the outlet end of the pipe.

g. Spillway. The original spillway consisted of a box culvert approximate dimensions, 8 feet wide by 5 feet high. This was located on the left (West) abutment. A new spillway consisting of seven arch CMP's (each 36" by 58") was constructed on the right (East) abutment in 1965 and the box culvert spillway was blocked off. This new spillway outlet channel (approximately 400-500 feet long) was originally lined with rock. Concrete headwalls were constructed around the pipes and the structure also has an approach apron slab and an outfall apron slab. This new spillway has functioned as a service spillway since 1976 when the outlet works pipe became plugged.

4. Available Engineering Data. No drawings or design data were available on either the dam or the spillway modification. Discussions with local residents yielded information on historical data and as-built conditions.

5. Inspection Findings.

a. Operation and Maintenance. The outlet pipe had been used to lower the lake prior to spring rains in order to minimize erosion in the spillway outlet channel. Since the outlet pipe became plugged, the spillway has functioned as a service spillway. Funding for maintenance is provided by both the Home Owners Association and the Village of Tarsney Lakes. Maintenance of the dam is minimal.

b. Embankment. A heavy stand of brush and trees cover the downstream slope of the dam. Erosion and the beginning of a surface slide is in evidence on the downstream face. The downstream embankment toe is submerged by the spillway flow caused by debris from the eroded spillway blocking the normal spillway discharge channel and forcing the flow on to the dam embankment toe. There are some cracks along the upstream shoulder, but no displacement was noted.

c. Outlet Works. The downstream outlet pipe and control valve were submerged and could not be inspected. The pipe is reportedly plugged as described in paragraph 3d.

d. Spillway.

(1) Box Culvert Spillway. The box culvert spillway was blocked with a masonry wall at the upstream end of the culvert when the new spillway was put in service in 1965. The box behind the wall was filled with dirt and debris. The abutment--embankment slope downstream of the spillway is severely eroded from past flows. Reportedly this erosion prompted the construction of the CMP spillway in 1965.

DEPARTMENT OF THE ARMY
KANSAS CITY DISTRICT, CORPS OF ENGINEERS
700 FEDERAL BUILDING
KANSAS CITY, MISSOURI 64106

IN REPLY REFER TO:

MRKED-FI

6 September 1978

SUBJECT: Tarsney Lake Dam, Phase I Inspection Report

District Engineer
U.S Army Engineer District, St. Louis
ATTN: LMSED
210 N 12th Street
St. Louis, Missouri 63101

1. Tarsney Lake Dam (MO - 20136) was inspected on 11 April 1978, by members of my staff. This inspection and subsequent evaluation were based on an appendix entitled "Recommended Guidelines for Safety Inspection of Dams", included in a report to Congress dated May 1975. A copy of our inspection report is inclosed. This dam was inspected for the St. Louis District of the Corps of Engineers based on a verbal agreement between Messrs. Jack R. Niemi (LMSED) of the St. Louis District and Paul D. Barber (MRKED) of the Kansas City District.

2. On the date of the inspection, the dam was on the verge of failure. An emergency was declared and under provisions of PL-99, manpower, equipment, material, and technical assistance was provided by the Kansas City District of the Corps of Engineers until the immediate danger had passed. The lake level was drawn down several feet and temporary repairs initiated by the owners. The dam is considered to be unsafe.

FOR DISTRICT ENGINEER:

Paul D. Barber

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as

PAUL D. BARBER
Chief, Engineering Division

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PHASE I REPORT
NATIONAL DAM INSPECTION PROGRAM
TARSNEY LAKE - MO 20136
JACKSON COUNTY, MISSOURI

Synopsis

FINDINGS: The Tarsney Lake Dam was on the verge of a failure at the spillway on the date of the inspection. An emergency was declared and under provisions of Public Law 99, the Kansas City District provided technical assistance, equipment and manpower to lower the lake and reduce the immediate threat to the dam. The embankment stability is very marginal and only 20 percent of the PMF (Probable Maximum Flood) can be routed through the lake without overtopping the dam. The dam is considered unsafe.

RECOMMENDATIONS: As a result of the emergency, the Kansas City District recommended that the dam be breached. At the writing of this report, this has not been done and we have no knowledge that the owners are planning to do this. In the event that the dam is not breached, we recommend that engineering studies be initiated by the owners to determine the most economical method of repairing and/or modifying the spillway and embankment to pass 100 percent of the PMF without the dam being overtopped.

(2) CMP Spillway. The spillway outlet channel has eroded to a depth of 10 to 15 feet in places and has worked back to the CMP structure. The apron downstream of the structure was undercut and had collapsed, leaving the downstream headwall unsupported. Erosion has undercut several of the pipes and the upstream headwall was visible under one of the pipes. Water was exiting under the pipes and actively eroding embankment material under the spillway on the day of the inspection.

Local residents had temporarily slowed the erosion by using sandbags to block four of the seven conduits which had been undermined. Discussion with local residents by the Kansas City District inspection team on 11 April indicated that the situation had deteriorated rapidly in the few days preceding the sandbagging.

6. Hydrology. The upstream drainage area is 0.76 square miles with normal pool at elevation 836 feet msl. Total reservoir storage at top of the dam is 240 acre-feet with 90 acre-feet available between the spillway crest and the top of the dam. With all seven of the CMP's in operation, the dam will be overtopped when 20 percent of the PMF (Probable Maximum Flood) is routed through the lake. The dam will be overtopped by a maximum of 2.2 feet and the duration of overtopping is about five hours under PMF conditions.

7. Stability. In order to accurately determine the safety factor of the embankment slopes, it would be necessary to complete a comprehensive sampling and testing program which is beyond the scope of this report. The average strength necessary for a given safety factor can be determined by a simplified analysis. The guideline criteria requires a minimum safety factor of 1.5 for the downstream slope under normal pool conditions. Under normal pool conditions a strength in excess of tan $\emptyset$ = 0.70 and cohesion 0.0 tsf would be required for a safety factor of 1.0. It is unlikely the embankment has a shear strength as high as tan $\emptyset$ = 0.70. The actual shear strength present is an unknown combination of friction (tan $\emptyset$) and cohesion.

8. Seepage. The downstream slope was covered with brush and trees making much of it inaccessible. No seepage through the embankment was noted but it is possible some seepage areas may have been overlooked due to the heavy vegetation cover. The embankment toe was covered with water and seepage in this area and could not be observed.

9. Downstream Hazard. The downstream hazard consists of 6 occupied dwellings and a State highway less than 1/2 mile downstream from the dam. There is no downstream warning procedure in effect. The hazard classification for this dam is high.

10. Conclusions. Based on the field inspection and subsequent analysis, the following conclusions have been reached:

a. The dam will be overtopped when 20 percent of the PMF (Probable Maximum Flood) is routed through the lake. The dam is considered unsafe.

b. On the date of the inspection, the dam was on the verge of failure at the spillway.

c. The hazard classification of the dam is high.

d. The dam embankment slopes are too steep to meet stability guideline requirements. The downstream embankment stability is very marginal.

e. Any significant overtopping of the dam would likely result in a dam failure.

11. Recommendations. Although the design of any remedial measures is beyond the scope of this report, the following suggestions are offered as possible means of improving the dam safety.

a. The dam should be breached if temporary repairs are not implemented prior to fall rains.

b. An engineering study should be initiated by the owner to design permanent repairs to the spillway and to determine the most feasible way to modify the spillway and/or embankment to safely pass 100 percent of the PMF.

c. The embankment stability should be improved.

d. The spillway discharge should be directed away from the toe of the embankment.

e. The outlet pipe should be cleaned out and placed in service.

f. Trees and brush growing on the embankment should be cut.

g. An emergency warning procedure should be devised and coordinated with local civil defense authorities to alert downstream residents and property owners of impending dangers during intense or prolonged storms.

h. A periodic inspection program should be initiated by the owner with a visual inspection taking place semiannually and a detailed inspection including studies, if necessary, at least every five years.

i. A continuing maintenance program should be initiated by the owner.

PAUL D. BARBER
Chief, Engineering Division

F file

ED-F

Barber/ss/5068

MRKED

12 April 1978

Board of Trustees
Village of Tarsney, Missouri

Dear Sirs:

This letter is to inform you about events of the past two days in relation to a serious problem at Tarsney Lake.

As the result of a downstream resident's phone call to this office on the morning of 11 April 1978, we sent an inspection team to Tarsney Lake to examine what had been described as a dam emergency. After briefly examining the dam, the inspection team reported back by phone that there was an emergency situation with the real possibility of a dam failure at the spillway location. Considering the potential threat to lives and property downstream of the dam and the loss of access for approximately 200 home owners on the east side of the lake, we notified Jackson County and Missouri officials and initiated action to pump down the lake with Corps of Engineers' equipment and personnel.

During the afternoon and evening of the 11th and earlier morning hours of the 12th, we assembled men and equipment and had pumped the lake down approximately 4 inches by 8:00 a.m. on the 12th. In addition we reinforced and heightened a small sandbag dike at the upstream end of the spillway. We accomplished this with Corps personnel aided by volunteers and with sand furnished by the Jackson County Highway Department.

The sandbag dike essentially blocks off flow through four of the seven corrugated metal pipes that serve as a spillway at the west end of the dam embankment. Previous seepage and flow of water around and under these four pipes at the west side of the spillway have critically undermined the pipes and the downstream concrete apron. At one location the soil has been eroded all the way to the upstream end of the pipe. A major portion of the concrete slab has collapsed and fallen into the eroded area downstream of the spillway.

MARKED 12 April 1976
Board of Trustees

Although the combination of the pumping and the sandbag dike has very briefly halted further erosion, it is at best a stopgap measure. The sandbag dike essentially reduces the spillway capacity by 4/7. Any significant rainfall that can be reasonably expected within the next few weeks would be expected to overtop the sandbag dike and continue the erosion process that is presently at the point of failure. Plugging these four pipes completely to retard further erosion would likely result in overtopping of the dam and possible failure of the dam.

The most positive measure at this point in time to alleviate the downstream threat would be to breach the dam and drain the lake. This, of course, would require construction of some sort of temporary road to provide access for the residents on the east side of the lake.

A less positive alternative would be to temporarily repair the spillway area to a point that it could possibly withstand runoff from rainfall for the next few weeks until permanent repairs and remedial work can be accomplished. I should point out that although this alternate might be more attractive to local residents, there are more risks involved. Among temporary repairs to be considered is grouting the voids around the pipes in the spillway and dumping large size rock into the gully just downstream of the spillway.

At present we appear to be drawing the lake down at the rate of about one-half inch per hour. We intend to pump the lake down to about two feet below the flowline of the spillway. On this basis, we will continue pumping at least until Friday morning. Also, during this period Corps personnel are available to advise the volunteers in methods to place additional sandbags. However, the number of volunteers is very small and it appears that positive action by someone in authority is essential at this point. With the lake about two feet below the spillway flowline, the lake will be able to contain about a one and one-half inch rainfall before water would flow through the spillway again. This provides slim margin of safety and an opportunity to do some temporary repair to the spillway if that is your choice.

When the lake is drawn down to about two feet below the spillway, it is our plan to cease our pumping operations at Tarsney Lake, return our people to their normal duties. Our pumps and other equipment will be returned to our various project offices. The next actions will be the responsibility of local officials. We do not have an authority for other than technical assistance once the immediate crisis is past. We will offer whatever we can in the way of technical advice and assistance.

We also began an overall inspection of the dam this afternoon. Besides the erosion problem in the spillway, there are other obvious deficiencies at this structure. The eight inch low flow outlet is plugged. The extremely steep downstream slope has already sustained some erosion and would likely quickly fail if overtopping should occur.

We have been attempting to find out who owns this dam so that that person or entity could make a decision on a course of action. Regrettably, ownership appears impossible to determine at this point. Contact has been made with the present President of Lake Development Co. Inc., which originally constructed the dam. Whether the Village of Tarsney Lake, the Homeowners Association, or the Corporation owns the lake is unclear. However, someone at a non-federal level must make a decision on which course to follow.

I cannot emphasize enough that the Corps' work at Tarsney Lake will only address the immediate threat of a dam failure. Additional rainfall at anytime could further jeopardize the dam's safety and cause a failure. Immediate action by local officials is required either by breaching the dam or making temporary repairs that will prevent a failure until permanent repair can be made. I strongly recommend that until one of these actions is accomplished that you provide 24-hour surveillance of Tarsney Lake dam so that as a minimum, downstream residents can be evacuated if a failure occurs.

In sum;

a. A serious problem exists at Tarsney Lake with potential hazard to life and property downstream.

b. The Corps of Engineers has been assisting in stopgap measures to arrest an imminent failure.

c. Should a heavy rainfall occur, it is quite likely the dam will fail.

d. Someone at a non-federal level needs to make a decision on what to do next.

e. Of potential courses of action, breaching the dam is the most positive action.

f. The Corps of Engineers stands ready to assist in this situation.

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HRKED
Board of Trustees

12 April 1978

I am furnishing copies of this letter to Mr. Mike White, Jackson County Executive and Major General Robert E. Buechler.

Sincerely yours,

RICHARD L. CURL
Colonel, Corps of Engineers
District Engineer

Copies furnished:
Mr. Mike White
Jackson County Executive
Courthouse
415 E. 12th Street, Room 200
Kansas City, MO 64106

Major General Robert E. Buechler
Office of Adjutant General
1717 Industrial Drive
Jefferson City, MO 65101

CF:
Read File
ED-X (yellow)

Tarsney Lake

Mr. Adams/dtm/5759
14 April 1978

NRKOD-EP

Mr. Mike White
Jackson County Executive
Courthouse
415 East 12th Street, Room 200
Kansas City, Missouri 64106

Dear Mr. White:

Reference is made to my letter of 12 April 1978 to the Board of Trustees, Village of Tarsney, Missouri. A copy of this letter was furnished to Mr. Jim Kissick, your representative present at our meeting with the Board of Trustees on 12 April 1978.

Following that meeting, local representatives of the Village of Tarsney began some efforts to relieve the problem, however, I am concerned that their efforts may not be enough to avert a failure of the dam in the event of expected rainfall.

The Corps of Engineers has done all that our authorities permit under the circumstances. We will be shutting down our pumps and moving our equipment and personnel out on 14 April 1978. My basic recommendation that the dam be breached and the lake drained until positive repairs are made is still applicable. The dam in its present condition will not withstand any significant runoff from rain storms that would be reasonably expected during the spring months ahead.

Since we cannot continue to monitor the dam, and since present efforts locally may not avert a failure, I strongly urge that Jackson County develop a plan for warning and evacuation of the downstream area in the event of rain. I stand ready to assist with technical advice on criteria for warning and evacuation and on any other measures you may wish to take to protect the citizens of Jackson County.

Sincerely yours,

RICHARD L. CURL
Colonel, Corps of Engineers
District Engineer

CF:
See attached sheet

Board of Trustees
Village of Tarsney, Missouri

Major General Robert E. Buechler
Office of Adjutant General
1717 Industrial Drive
Jefferson City, Missouri 65101

XXXXX

Name of Dam
Tarsney Lake
MO 20136

NATIONAL DAM INSPECTION PROGRAM
REPORT OF FIELD INSPECTION

GENERAL

1. Name of owner: Tarsney Lakes Homeowner's Assoc. | Lake Development Co., Inc. Thomas F. Sothan, Jr. (Pres.)
(disputed) ATTN: Edith Cole
Mailing Address: Rt. 2, Oak Grove, Mo.

2. Location
County Jackson County, Missouri
Section SE¼ 22 Range 30 W Township 48 N

3. Is location shown correctly on county map?

(X) Yes (correctly) Tarsney Lake, Mo. quad
( ) Yes (incorrectly)
( ) No

4. Is dam on inventory?

(X) Yes (corrections attached)
( ) No (completed form attached)

5. Type of dam (check all appropriate)

(X) Earth and/or rockfill (use MRK A)
( ) Concrete and/or masonary (gravity) (use MRK B)
( ) Other
Explain

6. Type of spillway (secondary spillway)

Controlled	Uncontrolled	Type	Use Form
( )	(X) (2)	Pipe or Conduit	MRK C
( )	( )	Chute or notch	MRK D
( )	( )	Overfall	blank sheet
( )	( )	Other	

Explain Left abutment box is abandoned (plugged) Rt. bank, 7 (3.4' x 4.6')

7. Type of outlet works (primary spillway)

(X) Controlled
( ) Uncontrolled
( ) Other 8" Ø CIP plugged unintentionally - not operable.

KB

8. Do the following exist?

	Yes Inclosed	Yes, Not Inclosed	No	Don't Know
Design data	( )	( )	(X)	( )
Plans and specs	( )	( )	(X)	( )
Shop drawings	( )	( )	(X)	( )
As builts	( )	( )	(X)	( )
O & M Manuals	( )	( )	(X)	( )
Inspection Reports	( )	( )	(X)	( )

Remarks (Include Owners AE or source of info) Rt. spillway built 12 years ago,has deteriorated rapidly since Sept 77. Dam has not overtopped but nearly did in Sep 77 (< 0.5' freeboard)

9. Is there any flood warning system at the dam?

( ) Yes (X) No
Remarks

10. Is there any evidence that the dam has ever been overtopped?

(X) No see above ( ) Yes
( ) High water marks
( ) Erosion
( ) Evidence of repair
( ) Verbal reports
( ) Other
Explain.

No history of actual overtopping.

11. Estimate the degree of lake siltation.

( ) No noticeable siltation in lake
(X) Some minor amount of siltation
(?) Lake has major amounts of siltation

Remarks Upstream portion appears to have silted in quite a little.

12.

Downstream Improvements	Valley Distance (miles)	Type of Improvement (indicate number): Occupied dwelling	Unoccupied dwelling	Agricultural Building	Industrial Building	Other Building	Road	Railroad	Urban Area	Dam (give ID number)	Other	Loss Of Life Potential: Likely more than 4	Likely 4 or less	Possible, but not likely	Economic Loss Potential: Less than $50,000	$50,000 to $500,000	More than $500,000	Remarks
1	0.1					✓								✓	✓			Community Bldg.
2	1/4	2										✓				✓		
3	1/4						✓							✓				Damage minimal
4	0.1	3												✓		✓		
5																		
6																		
7																		
8																		
9																		
10																		

-- XX MD 20136

The above list was ended because:

(✓) We do not feel that points further downstream are seriously threatened by the dam

( ) We have already established a very high downstream hazard, but further downstream hazard exists

( ) We cannot tell, further study is needed

( ) Other
Explain _____

13. Are there any type of instruments on the dam?

(X) No ( ) Yes

( ) Monumentation
( ) Piezometers
( ) Weirs or other water measuring device
(X) Other
Explain Temporary pumping facilities 9 - 6" pumps ?

14. Give your overall opinion of the downstream hazard potential.

Team member	1. High	2. Significant	3. Low	Can't Decide
R. Davidson	(✓)	( )	( )	( )
J. Nelson	( )	(✓)	( )	( )
W. Lewis	(✓)	( )	( )	( )
R. Browning	(✓)	( )	( )	( )

Category	Loss of Life (Extent of Development)	Economic Loss (Extent of Development)
Low	None expected (No permanent structures for human habitation)	Minimal (rural or agricultural areas where failure may damage farm buildings, limited agricultural lands or townships and country roads)
Significant	Few (No urban developments and no more than a small number of inhabitable structures)	Appreciable (Predominantly rural or agricultural areas where failure may damage isolated homes, secondary highways or minor railroads)

High	More than few	Excessive (Serious damage to homes, extensive agricultural, industrial and commercial facilities, important public utilities, main highways or railroads)

15. Information on upstream drainage area.
Check one that best describes relief:

( ) flat lands
( ) low hills
(X) steep hills
( ) other
Explain _____

Give approximately percentage of each:

Urban	20 %	(lake homes)
Timber	50 %	
Grass land	30 %	
Crop land	____ %	

Explain 200 homes around lake.

Total 100%

Remarks (give any information that would help evaluate the runoff characteristics of upstream drainage area) (Dams, US, etc.) _____

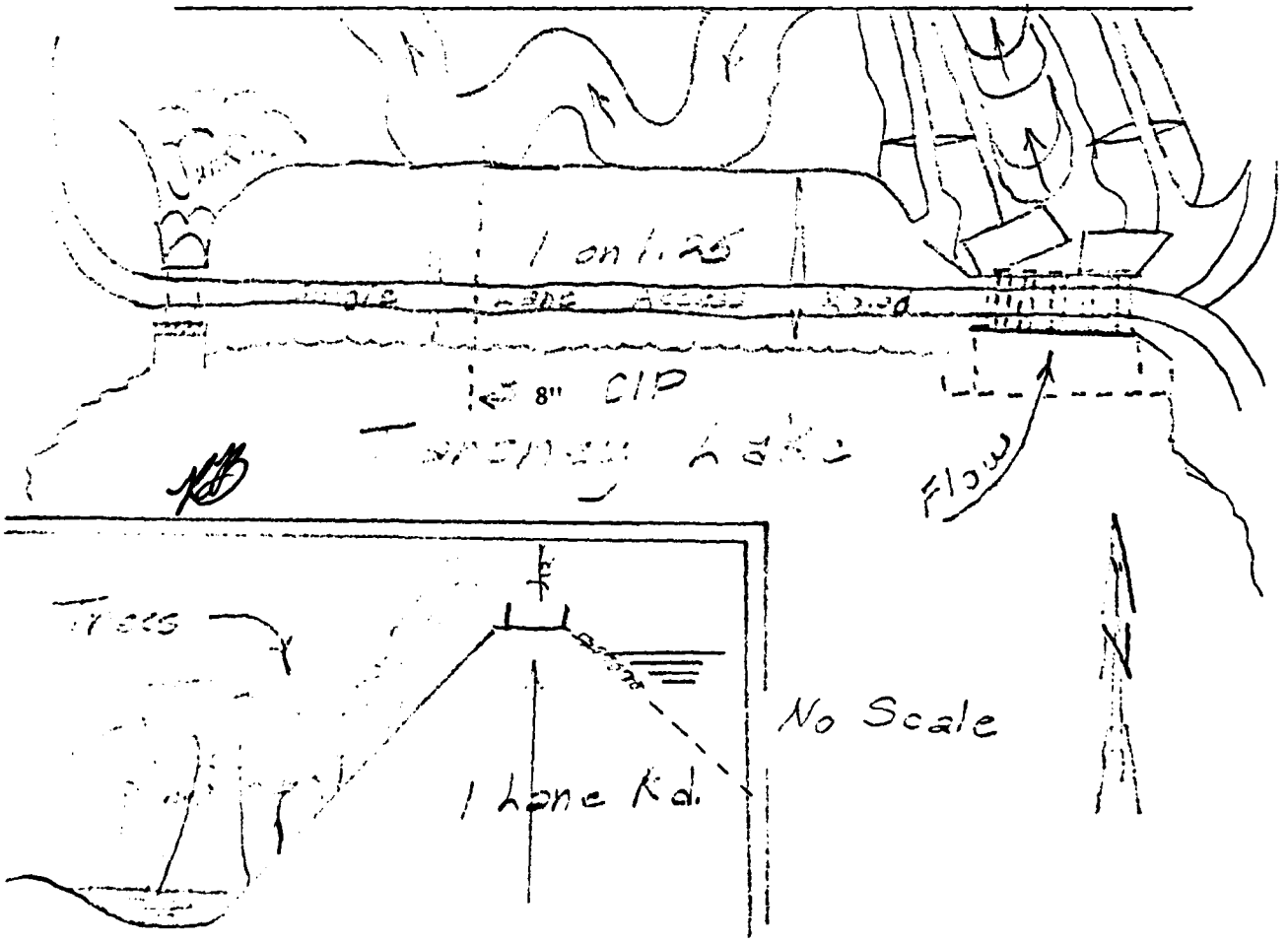
Mostly steep timbered hills.

16. Check which item best describes the condition of the channel upstream of the lake.

( ) Clear of debris, trees, etc.
( ) Some minor debris in channel and a few trees periodically in channel
(X) Much debris in channel and many trees adjacent to channel

Remarks This is a "wild" almost undeveloped area in the immediate vicinity of the lake property.

17. On a separate sheet, sketch the overall plan of dam and spillway and outlet work. Describe features not adequately shown on sketch or photos. Include photos as necessary to show features.



What recommendation do you have for improving the safety of the dam? (Discuss Feasibility of improvements.)

1. Immediate repair of spillway outlet.
2. Provide drops and repair spillway channel.
3. Divert discharge away from the dam and provide fill or berm.
4. Open the 8-inch conduit and fix valve for control.
5. Provide for proper maintenance.

Participants in the dam inspection:

Name	Title	Agency
R. Davidson	Supvy Civil Engr	USCE
W. Lenz	Civil Engr	USCE
J. Nelson	Hydrologist	USCE
R. Browning	Civil Engr	USCE

List of attached forms:

( ) Eng Form 6474
( ) Eng Form 6474A
(X) County map or other (specify) USGS Quad Sheet
(X) NDK Form A - Embankment Dam
( ) NDK Form B - Concrete or Masonry Dam
(X) NDK Form C - Pipe or Conduit
(X) NDK Form D - Spillway
(X) NDK Form E - Surface condition of concrete
(X) NDK Form F - Site Geology
(X) 5 Photographs
( ) Other. (List)

Date 11 Apr 78
ID XXS MD 20136

Embankment Dam

1. On a separate sheet, draw one or more sections through the dam. Show crest width, height, slopes, location of outlets, slope protection, water surface, high water marks, eroded or damaged areas, seepage, etc. Use datum established in question. Describe features not adequately shown on sketch. (Attach photos) (How constructed, history of project, etc.)

See page 6 of General section.

2. Are there any signs of instability?

(X) Cracks
( ) Creep
(X) Sloughing
(X) Irregularities in crest or waterline
(X) Excessively steep slopes
( ) History of sliding
(X) Other

Explain Embankment is much too steep. Cracks along upstream shoulder, surface erosion of downstream slope, subm. toe.

Give your opinion of the stability of the dam.

( ) Embankment has no visible stability problems and may meet criteria set forth in the guidelines
( ) Embankment has no visible stability problems but probably does not meet the criteria set forth in the guidelines
( ) Embankment has minor stability problems but unlikely to lead to failure
( ) Embankment has stability problems which if not corrected could lead to failure
(X) Embankment has serious stability problems which could lead to failure at any time

FORM A

(X) Other
Explain In addition to the above, the spillway is part of the embankment and in a state of progressive failure.

3. Is there any evidence of seepage?

Yes	No	N/A	Can't Tell	
( )	( )	( )	(X)	Downstream slope
(X)	( )	( )	( )	Downstream of dam
( )	(X)	( )	( )	Left abutment (looking downstream)
(X)	( )	( )	( )	Right abutment (looking downstream)
(X)	( )	( )	( )	Around structure
( )	( )	( )	(X)	Other

Explain fully (quantity, turbidity, location, point source or general area, etc.) Serious bypass seepage beneath and around conduits. Channel along downstream toe for middle 1/3 of the dam. Q is estimated at 1 to 2 cfs.

Give your opinion of seriousness of seepage.

( ) Unlikely that it will become a problem in the forseeable future
( ) May or may not become a problem
( ) Is a problem but not likely to lead to failure
( ) Is presently a problem which if not corrected could lead to failure
(X) Serious problem which could lead to failure at any time

Remarks: See above.

4. Is there any evidence of erosion?

Yes	No	N/A	Can't Tell	
(X)	( )	( )	( )	Upstream slope
(X)	( )	( )	( )	Downstream slope
( )	(X)	( )	( )	Crest
(X)	( )	( )	( )	Around structures
(X)	( )	( )	( )	Right abutment (looking downstream
( )	(X)	( )	( )	Left abutment (looking downstream)
(X)	( )	( )	( )	Others

Remarks Outlet channel is badly headcutting toward the dam - failure of spillway in progress.

Give your opinion of the seriousness of the erosion.

( ) Unlikely that it will become a problem in the forseeable future
( ) May or may not become a problem
( ) Is a problem but not likely to lead to failure
( ) Is a problem which if not corrected could lead to failure
(X) Is a serious problem which could lead to failure at any time

Describe material being eroded - estimate uniform soil classification.

Compacted impervious - CL and existing colluvium and alluvium - CL

Is there any evidence of dispersive clays? ( ) Yes (X) No

Explain

Is there any slope protection on the embankment? (X) Yes ( ) No

Describe (type and condition) Old limestone riprap - some disturbed due to wave action and slump of the upstream slope at beach line.

5. General condition of dam - maintenance, mowing, trees in embankment, animal burrows, etc.

Very little maintenance performed - only emergency repair (e.g., the spillway construction, the CIP outlet shutoff, etc.)

6. Based on the exposed material in the downstream channel and other physical evidence, describe the foundation material.

Lean clay overburden on sedimentary rock - largely shales with limestone zones.

7. In your opinion, is there anything about the embankment which warrants special consideration in deciding whether or not to perform a more detailed investigation? (X) Yes ( ) No

If yes, why? Also, what specific problem or questions should the analysis try to resolve?

See attached letters.

Date 11 April 78
ID KS MO 20136

Outlet Works

1. Give name of the feature described in this section (as shown on drawings, common usage, etc.)

( ) Principal spillway
(X) Outlet Works
( ) Other
Name _____

2. Type of outlet works.

(X) Controlled
( ) Uncontrolled

3. Does any outlet works operational data (inspection reports, rating curves, days of operation, etc.) exist?

( ) Yes, data is included
( ) Yes, but not included. Explain _____

( ) Don't know
(X) No

4. On a separate sheet, sketch the outlet works (to include conduit and inlet and outlet - stilling basin) structure. Show location of control structure if any and all pertinent dimensions and elevations of the outlet pipe or conduit. Include photos as necessary to illustrate features. Describe features not adequately shown on the sketch or in photos.

See sketch on sheet 6

Outlet works consisted of an 8" Cast Iron Pipe with a downstream shut off valve. Valve on the downstream end was leaking and repair was attempted by blocking intake end with plastic garbage bags filled with sand. One of these bags entered the pipe when it was attempted to remove the.

5. Structural integrity of inlet structure (for concrete condition, use Form E).

(X) Inundated
( ) In good workable condition and unlikely to become a problem in the forseeable future
( ) The conduit has some structural problems which are not likely to lead to failure during an emergency
( ) The conduit has some serious structural problems which could lead to failure if the defects are not corrected
( ) The conduit has serious structural problems which could lead to failure at any time
Remarks Downstream end of pipe was inundated.

6. Trash racks, describe. N/A

7. Type of conduit or pipe.

( ) Concrete pipe
( ) CMP
( ) RCB
(X) Other
Remarks Cast iron pipe in base of dam.

8. Give your opinion of the structural integrity of the pipe or conduit.

(X) Not accessible, could not inspect
( ) In good workable condition and unlikely to become a problem in the forseeable future
( ) The conduit has some structural problems which are not likely to lead to failure during an emergency
( ) The conduit has some serious structural problems which could lead to failure if the defects are not corrected
( ) The conduit has serious structural problems which could lead to failure at any time.

Date 11 April 78

ID KS MO 20136

Remarks _____

9. Stilling Basin.

(X) Plunge Pool
( ) Concrete Basin
( ) Riprapped Basin

10. Describe the general condition of the outlet works. (Type of material, amount of corrosion, maintenance, etc.)

Could not inspect -However, pipe is inoperable according to residents since the pipe is blocked.

11. In your opinion, is there something about the outlet works which would warrant special consideration in deciding whether or not to perform a more detailed investigation? ( ) Yes (X) No

If yes, why? Also, what specific problems or questions should the analysis try to resolve?

Spillway Data

1. Give name of feature inspected (as shown on drawings, common usage, etc.)

( ) Emergency spillway
( ) Secondary spillway
(X) Other
Name Service Spillway

2. On a separate sheet, draw a plan of the spillway and one or more cross-sections of the spillway which show dimensions, location of concrete sills, etc. Show the elevation of the top of the dam in relation to the spillway crest. Describe features not adequately shown on the sketch. Attach photos.

Box culvert spillway utilized as limited service spillway on left abutment. Box culvert spillway sealed in 1965 when new spillway was constructed. New spillway consisting of 7 CMP's (36" X 58") constructed on right abutment during 1965. This spillway has functioned as a service spillway since the outlet pipe which was plugged in 1976.

3. Is there any evidence of erosion?

Yes	No	N/A	Can't Tell	
(X)	( )	( )	( )	Spillway floor
( )	( )	(X)	( )	Spillway side slopes
(X)	( )	( )	( )	Around control sill
(X)	( )	( )	( )	Around spillway gates or control structure

Other. Explain

Spillway outlet channel severely eroded back to structure, undermining CMP's under roadway.

Give your opinion of the seriousness of the erosion.

( ) Unlikely that it will become a problem in the forseeable future
( ) May or may not become a problem
( ) Is a problem but not likely to lead to failure

( ) Is a problem which if not corrected could lead to failure
(X) Is a serious problem which could lead to failure at any time
( ) Other
Explain Active erosion beneath spillway CMP's. Has gotten considerably worse in the few days preceeding the inspection.

4. Describe the material in which the spillway is constructed. Estimate the uniform soil classification if in soil or type of rock and formation if in rock.

5. Check all the applicable items which describe the spillway.

( ) Gated spillway
( ) Lined with concrete or slope protection
( ) Concrete control sill
( ) Unlined in soil
( ) Unlined in rock
(X) Other
Remarks 7 (CMP's) 36" X 58" - concrete apron slab and head walls - Road passing over CMP's.

6. Are there any spillway gates?

(X) No
( ) Yes (Form _____ inclosed)
( ) Yes (Form _____ not inclosed)
Explain

7. Give your opinion of the general condition of the spillway.

The spillway is in a state of progressive failure by water eroding the material beneath the spillway pipes.

8. Are there any obstruction to flow through the spillway? (U.S. or D.S)
( ) Yes (X) No
Describe

9. In your opinion would a spillway discharge have a tendancy to erode the embankment?

( ) No
(X) Yes
Describe Spillway outlet channel is clogged with debris and forcing flow onto the embankment toe.

10. In your opinion, is there something about the spillway that warrants special consideration in deciding whether or not to make a more detailed investigation? ( ) No (X) Yes

If yes, why? Also, what specific questions do you think should be answered by this investigation?

Recommend engineering study to determine best method to repair spillway channel and spillway structure.

Surface Condition of Concrete
(from ACI Report 65-67)

1. Identify the feature for which this section applies. _____

Principal spillway

2. General condition of concrete.

( ) Good
( ) Satisfactory
(X) Poor
Remarks _____

3. Cracks. (X) Yes ( ) No

Direction
( ) Longitudinal
( ) Transfers
(X) Vertical
( ) Diagonal
(X) Random

Width
( ) Fine (less than 1 mm)(1/32") (.03")
( ) Medium
(X) Wide (more than 2 mm) (5/64") (.06")

Type
( ) Pattern Cracking
( ) Checking
( ) Hairline cracking
( ) D-cracking

Mineralization
( ) leaching
( ) efflorescence
( ) deposition

Describe. (Sketch or include photo if significant) _____

4. Scaling. (X) Yes ( ) No
Describe (depth & extent) _____

Minor scaling on spillway approach slab for service spillway on right abutment.

Severity
(X) Moderate (no loss of C.A.)
( ) Severe (loss of C.A.)
(Give depth of scaling) 21"

5. Exposed steel. ( ) Yes (X) No
Separately describe and photograph each area.
Agent: ( ) Corrosion ( ) Erosion ( ) Spalls ( ) Other
Location: _____
Extent: _____ Depth: _____
Condition: ( ) Good ( ) Fair ( ) Poor ( ) Disintegrated/ Missing
Type: ( ) Rebar ( ) Beam ( ) Plate ( ) Mesh ( ) Other

Remarks (location, extent, depth): No steel visible. Probably no steel used or possible wire mesh

6. Spalls. ( ) Yes (X) No

Size
( ) Small (less than 2 cm deep and 15 cm long)
( ) Large

Describe _____

7. Is (are) there any:

( ) Honeycomb (X) None
( ) Stains
( ) Popouts
( ) Previous patching or other repair
( ) Chemical attach

Describe _____

8. In your opinion, what is the effect of the condition of the concrete on the safety of the dam?

( ) Little or none
( ) May create operational problems, but no safety problem
( ) If uncorrected, could eventually become a safety problem
(X) It is a safety problem that could result in a large uncontrolled release of water
( ) Other
Explain _____

Remarks Concrete is badly cracked and broken but is not a result of the concrete quality but the erosion of soil beneath it.

Site Geology

1. Does dam or lake abut a narrow (less than 1000') ridge?

( ) Yes (X) No

2. Is there any evidence of where the material for the embankment came from?

(X) No
( ) Yes
Describe location and probable material type (unified soils classification system) Dam appears to be CL to CH probably from upstream (and maybe downstream). Alluvium and/or adjacent hillside borrow.

3. Is there any evidence of rapid erosion (deep, narrow, watercourse)?

( ) Upland
(X) Valleywalls/hillsides
( ) Valley
Describe This is typical of the watershed. Specifically, the channel has degraded 12 ft+ and progressing rapidly.

4. Is there any evidence of sliding or slumping in natural soil or rock?

( ) No
(X) Yes
Describe General area shows evidence of instability where slopes are too steep.

5. Are there any sinkholes or surface depressions?
(X) No
( ) Yes
Describe

6. Are there open or solutioned joints/bedding planes?

(*) No
( ) Yes
Describe Not in bedrock.

7. Does normal lake level appear to be related to geology rather than to control structures, ie.: limestone, sandstone or pervious soils unit exposed at water level along shoreline?

(X) No
( ) Yes
Describe. Include height below top of dam, spillway and outlet works intake.

8. Do any exposed bedrock members, below top of dam, have soft clay seams?

(X) No
( ) Yes
Describe (thickness, height below top of dam, statigraphic relationships). Sketch if necessary.

9. Describe any other geologic conditions affecting the water control structures. Friable clays are rapidly eroding due to steep grade and velocity of the outlet channel.

10. In your opinion, is there anything about the geology that warrants special consideration in deciding whether or not to perform a more detailed investigation? ( ) Yes (X) No

If yes, why? Also, what specific questions do you feel the investigation should attempt to resolve? _____

_____

_____

_____

HYDROLOGIC AND HYDRAULIC ANALYSIS METHODOLOGY

1. The hydrologic analysis is based on applying a design storm to a unit hydrograph to obtain the inflow hydrograph for the reservoir routing. The unit hydrograph is developed using Snyder's method outlined in EM 1110-2-1405 (Flood Hydrograph Analyses and Computations). The design storm for those dams in the high hazard potential category is derived from the probable maximum precipitation as determined from regional charts prepared by the National Weather Service in "Hydrometeorological Report No. 33." A 24-hour storm duration is assumed with the 24-hour rainfall amounts reduced to six-hour values in accordance with procedures outlined in EM 1110-2-1411 (SPF Determination). The maximum six-hour rainfall is reduced to smaller time increments based on a storm distribution as proposed by the SCS in their hydrology handbook. The remaining six-hour rainfall amounts are divided into equal values corresponding to the unit hydrograph duration. Runoff values are obtained by reducing the rainfall amounts by applicable initial and infiltration losses. The Probable Maximum Flood (PMF) hydrograph is derived by applying the runoff values to the unit hydrograph. The resulting PMF hydrograph is then used as the inflow hydrograph for a reservoir routing.

2. The reservoir routing is accomplished by using a standard routing technique wherein the flood hydrograph is routed through lake storage. Hydraulic capacities of the outlet works, spillway, and crest of dam are used as outlet controls in the routing. Storage in the pool area is defined by an elevation-capacity curve. The hydraulic capacity of the outlet works, spillway, and top of dam are defined by elevation-discharge curves. The program offers several options for development of the above curves.

3. If the dam is overtopped by the PMF hydrograph, the PMF hydrograph ordinates are incrementally reduced by ten percent until the dam is no longer overtopped. This computation determines the percentage of the PMF hydrograph that can be routed through the reservoir without the dam being overtopped.

RESULTS OF HYDROLOGIC AND HYDRAULIC
ANALYSIS FOR TARSNEY LAKE

1. The drainage area above Tarsney Lake is characterized by relatively steep hills. The average stream slope above the lake is 130 feet per mile. Fifty percent of the area is timbered, with 30 percent in grassland and 20 percent urbanized. The urbanization is almost entirely composed of residences around the perimeter of the lake.

2. No hydrologic design data were available for the dam. The elevation-capacity curve was obtained by planimetering contours from quadrangle sheet. The spillway rating and the top of dam rating were obtained by using backwater computations with the respective profiles as cross section data.

3. The pertinent information on the hydrologic evaluation of Tarsney Lake is as follows:

Drainage Area: 0.76 sq. mi.
Snyder's Unit Graph Values: L = 1.30 miles; L_{ca} = .60 mi.
C_p = .63; C_t = .70; .25 hour unit graph

Infiltration: 0.50 inch initial; .05 in/hr thereafter
Design Storm: Probable Maximum Precipitation (PMP) with 23.8 inches runoff in 24 hours.
PMF Peak Inflow: 3,700 c.f.s.
Reservoir Storage Available: 90 acre-feet between normal lake elevation and low point of dam (840 ft., m.s.l.).
Spillway Data: 7 - 36" x 58" CMPA; invert elevation 836 ft., m.s.l.
Outlet Works: 8" CMP that was inadvertently plugged.
Top of Dam: Variable profile with low point of 840 ft., m.s.l., and high point of 842.0 ft., m.s.l.
Routing Procedure: Route the PMF beginning at 836 ft., m.s.l.
Maximum Pool Stage: 842.2 ft., m.s.l.
Depth of Overtopping: The dam is overtopped by 2.2 feet at the low point for approximately 5 hours.
Percent of PMP Without Overtopping: 20 percent

4. The dam at Tarsney Lake would be overtopped for about 5 hours if a storm of the PMP magnitude occurred. The maximum depth of overtopping for a PMF event would be 2.2 ft. at the low point of the dam. The dam is capable of passing a storm of only 20 percent of the PMP.

•••••••••••••••••••• LISTING OF CARD INPUT DATA •••••••••••••••••••• PAGE 1

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TARSNEY LAKE--MO.ID NO. 20137
8-11-78    RRS
BEGINNING ELEV FOR PMF ROUTING- ELEV 836
SPILLWAY CREST ASSUMED TO BE ELEV 836 (FROM USGS QUAD SHEET)
5
.25      .76      836.
SNYDERS UG-EST FLOW VELOCITY = 2 MPH
1.3      .4       .62      .76      .65
PMP STORM-ZONE 7
102.     120.     130.     24.3     .50      .05
ELEV-CAP FROM PLANIMETERED AREAS  4-12-78
4.0      10.
810.     0.       815.     1.       820.     9.       825.     29.      830.     70.
835.     120.     836.     153.     841.     276.     842.     307.     845.     407.
SPWY RATING FOR 7-36"X58" CMP  RATED BY JDN 4-19-78
2.0      10.      836.
836.     0.       837.     70.      838.     225.     839.     435.     840.     470.
841.     528.     842.     595.     843.     695.     844.     810.     845.     959.
TOP OF DAM RATING COMPUTED BY CRIT DEPTH FROM FOLLOWING X-SEC DATA
1.0      8.       840.
0.       850.8    100.     840.8    140.     840.     200.     840.     300.     841.
600.     841.     700.     842.     800.     852.
NO OUTLET - INADVERTENTLY PLUGGED 6" CMP
0.
FINISHED
```

DAM INSPECTION HYDROLOGIC ANALYSIS - SUMMARY OF UNIT HYDROGRAPH ORDINATES AND RAINFALL, LOSS AND EXCESS

TANSNEY LAKE--MO.ID NO. 20137
8-11-78 RRS
BEGINNING ELEV FOR PMF ROUTING- ELEV 836
SPILLWAY CREST ASSUMED TO BE ELEV 836 (FROM USGS QUAD SHEET)
5

SNYDERS .250 HOUR UNIT HYDROGRAPH ORDINATES IN CFS AT .250 HOUR INTERVALS BEGINNING AT ZERO TIME

0.0	146.6	340.8	414.6	316.5	215.5	178.8	142.2	105.6	69.0	32.3	0.0

PROBABLE MAXIMUM RAINFALL, LOSSES AND EXCESS FOR SUCCESSIVE .250 HOUR PERIODS.

.034	.034	.034	.034	.034	.034	.034	.034	.034	.034	.034	.034
.034	.034	.034	.034	.034	.034	.034	.034	.034	.034	.034	.034
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
.034	.034	.034	.034	.034	.034	.034	.034	.034	.034	.034	.034
.034	.034	.024	.013	.013	.013	.013	.013	.013	.013	.013	.013
0.000	0.000	.010	.022	.022	.022	.022	.022	.022	.022	.022	.022
.146	.146	.146	.146	.146	.146	.146	.146	.146	.146	.146	.146
.013	.013	.013	.013	.013	.013	.013	.013	.013	.013	.013	.013
.133	.133	.133	.133	.133	.133	.133	.133	.133	.133	.133	.133
.146	.146	.146	.146	.146	.146	.146	.146	.146	.146	.146	.146
.013	.013	.013	.013	.013	.013	.013	.013	.013	.013	.013	.013
.133	.133	.133	.133	.133	.133	.133	.133	.133	.133	.133	.133
.496	.198	.496	.397	.595	.496	1.031	.753	3.867	3.569	1.091	.892
.013	.013	.013	.013	.013	.013	.013	.013	.013	.013	.013	.013
.483	.186	.483	.384	.582	.483	1.019	.741	3.854	3.557	1.079	.880
.892	.793	.496	.496	.496	.496	.397	.397	.397	.397	.297	.397
.013	.013	.013	.013	.013	.013	.013	.013	.013	.013	.013	.013
.880	.781	.483	.483	.483	.483	.384	.384	.384	.384	.285	.384
.047	.047	.047	.047	.047	.047	.047	.047	.047	.047	.047	.047
.013	.013	.013	.013	.013	.013	.013	.013	.013	.013	.013	.013
.034	.034	.034	.034	.034	.034	.034	.034	.034	.034	.034	.034
.047	.047	.047	.047	.047	.047	.047	.047	.047	.047	.047	.047
.013	.013	.013	.013	.013	.013	.013	.013	.013	.013	.013	.013
.034	.034	.034	.034	.034	.034	.034	.034	.034	.034	.034	.034

DAM INSPECTION HYDROLOGIC ANALYSIS - LAKE ELEVATIONS, STORAGES AND DISCHARGE RATING TABLES

TARSNEY LAKE--MO.ID NO. 20137

LAKE ELEVATION FT.MSL	LAKE STORAGE AC-FT	STORAGE PLUS HALF DISCHARGE AC-FT	OUTLET DISCHARGE C.F.S.	SPILLWAY DISCHARGE C.F.S.	OVER TOP OF DAM C.F.S.	TOTAL DISCHARGE C.F.S.
845.000	407.000	582.622	0.000	959.000	16041.005	17000.005
844.000	370.531	487.668	0.000	810.000	10528.707	11338.707
843.000	337.292	404.301	0.000	695.000	5791.392	6486.392
842.000	307.000	335.385	0.000	595.000	2152.644	2747.644
841.000	276.000	285.068	0.000	528.000	349.752	877.752
840.000	245.351	250.206	0.000	470.000	.000	470.000
839.000	218.075	222.569	0.000	435.000	0.000	435.000
838.000	193.804	196.128	0.000	225.000	0.000	225.000
837.000	172.210	172.933	0.000	70.000	0.000	70.000
836.000	153.000	153.000	0.000	.000	0.000	.000
835.000	120.000	120.000	0.000	0.000	0.000	0.000
834.000	107.765	107.765	0.000	0.000	0.000	0.000
833.000	96.765	96.765	0.000	0.000	0.000	0.000
832.000	86.876	86.876	0.000	0.000	0.000	0.000
831.000	77.988	77.988	0.000	0.000	0.000	0.000
830.000	70.000	70.000	0.000	0.000	0.000	0.000
829.000	58.714	58.714	0.000	0.000	0.000	0.000
828.000	49.237	49.237	0.000	0.000	0.000	0.000
827.000	41.282	41.282	0.000	0.000	0.000	0.000
826.000	34.604	34.604	0.000	0.000	0.000	0.000
825.000	29.000	29.000	0.000	0.000	0.000	0.000
824.000	22.962	22.962	0.000	0.000	0.000	0.000
823.000	18.176	18.176	0.000	0.000	0.000	0.000
822.000	14.384	14.384	0.000	0.000	0.000	0.000
821.000	11.379	11.379	0.000	0.000	0.000	0.000
820.000	9.000	9.000	0.000	0.000	0.000	0.000
819.000	5.806	5.806	0.000	0.000	0.000	0.000
818.000	3.743	3.743	0.000	0.000	0.000	0.000
817.000	2.412	2.412	0.000	0.000	0.000	0.000
816.000	1.554	1.554	0.000	0.000	0.000	0.000
815.000	1.000	1.000	0.000	0.000	0.000	0.000
814.000	.399	.399	0.000	0.000	0.000	0.000
813.000	.159	.159	0.000	0.000	0.000	0.000
812.000	.063	.063	0.000	0.000	0.000	0.000
811.000	.025	.025	0.000	0.000	0.000	0.000
810.000	0.000	0.000	0.000	0.000	0.000	0.000

DAM INSPECTION HYDROLOGIC ANALYSIS - SUMMARY TABLE

TARSNEY LAKE--MO.ID NO. 20137
8-11-78 RRS
BEGINNING ELEV FOR PMF ROUTING- ELEV 836
SPILLWAY CREST ASSUMED TO BE ELEV 836 (FROM USGS QUAD SHEET)
5

SYNDERS .250 HOUR UNIT HYDROGRAPH DATA AND PARAMETERS

DURATION HOURS	DA SQ-MI	L MILES	LCA MILES	CP	CT	QP C.F.S	TP HOURS	W50 HOURS	W75 HOURS	UNIT VOL AC-FT
.250	.76	1.30	.60	.630	.700	448.7	.65	.79	.46	40.53

PROBABLE MAXIMUM STORM PRECIPITATION AND RUNOFF CHARACTERISTICS

PMP INDEX	RAIN FACTOR	DISTRIBUTION IN PERCENT OF PMP 6-HR	12-HR	18-HR	24-HR	INT-LOS INCHES	INF-RATE INCH/HR	VOLUME IN INCHES RAIN	LOSS	EXCESS
24.30	.800	102.00	120.00	125.75	130.00	.50	.05	25.27	1.52	23.75

LAKE INFLOW HYDROGRAPH ORDINATES

PROBABLE MAXIMUM FLOOD HYDROGRAPH ORDINATES IN CFS AT .250 HOUR INTERVALS BEGINNING AT ZERO TIME

0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	1.5	6.7	14.9	23.0	28.9	33.2	36.8	39.5	41.5
42.6	59.3	97.3	143.5	178.7	202.7	222.6	238.5	250.2	257.9	261.5	261.5
261.5	261.5	261.5	261.5	261.5	261.5	261.5	261.5	261.5	261.5	261.5	261.5
261.5	312.8	388.5	475.7	550.0	649.9	754.4	910.6	1100.5	1712.8	2806.8	3671.1
3704.7	3212.7	2840.8	2560.5	2216.6	1848.3	1523.1	1225.3	1030.4	930.1	860.5	800.9
754.3	681.6	561.6	419.6	309.3	237.5	178.6	132.4	99.1	78.2	66.9	66.9
66.9	66.9	66.9	66.9	66.9	66.9	66.9	66.9	66.9	66.9	66.9	66.9
66.9	61.9	50.3	36.1	25.3	18.0	11.9	7.1	3.5	1.1	0.0	0.0

LAKE AND DAM INFORMATION

BEGINNING POOL ELEV FT.MSL	OUTLET INVERT FT.MSL	BOTTOM OF LAKE FT.MSL	SPILLWAY CREST FT.MSL	SPILLWAY CREST WIDTH FEET	TOP OF DAM ELEVATION FT.MSL	TOP OF DAM LENGTH FEET	HEIGHT OF DAM FEET	DOWNSTREAM SLOPE OF DAM	N-VALVE ON DS SLOPE	COEF OF FLOW OVER DAM
836.00	0.00	810.00	836.00	0.0	840.00	0.0	30.0	1V ON 3.00H	.030	2.90

SUMMARY OF FLOOD ROUTINGS OF INFLOW HYDROGRAPH THROUGH THE LAKE

ROUTING NUMBER	PERCENT PMF INFLOW HYDROGRAPH	TOTAL INFLOW VOLUME AC-FT	MAXIMUM LAKE ELEVATION FT.MSL	DEPTH OF LAKE OVER TOP OF DAM FEET	ESTIMATED VELOCITIES CREST FPS	TOE FPS	INITIAL TIME TO OVER TOP HOUR	TOTAL TIME OVER DAM HOURS	VOLUME SPILLED OVER DAM AC-FT	MAXIMUM DISCHARGE FROM DAM CFS
1	100.0	963.	842.24	2.24	6.93	18.28	14.38	5.33	493.0	3640.0
2	90.0	867.	842.13	2.13	6.76	17.74	14.50	5.08	416.8	3233.0
3	80.0	770.	841.99	1.99	6.54	17.05	14.61	4.81	341.9	2738.0
4	70.0	674.	841.78	1.78	6.18	15.93	14.72	4.51	268.8	2337.0
5	60.0	578.	841.55	1.55	5.78	14.68	14.84	4.15	197.7	1913.3
6	50.0	481.	841.32	1.32	5.31	13.29	14.99	3.66	129.4	1468.3
7	40.0	385.	841.05	1.05	4.75	11.62	15.20	2.96	65.3	977.1
8	30.0	289.	840.34	.34	2.71	5.91	15.69	1.67	12.3	609.0
9	20.0	193.	839.03	-.97	0.00	0.00	0.00	0.00	0.0	435.9

MISSOURI RIVER DIVISION
MISSOURI CONT'D
JACKSON COUNTY CONT'D

INVENTORY OF DAMS 1976 — Tarsney Lake

KANSAS CITY DISTRIC

IDENTIFICATION STATE	IDENTIFICATION NUMBER	DIV	PRINCIPAL ST	PRINCIPAL COUNTY	PRINCIPAL CONG DIST	SECONDARY ST	SECONDARY COUNTY	SECONDARY CONG DIST	OFFICIAL DAM NAME	LATITUDE DEG	LATITUDE MIN	LONGITUDE DEG	LONGITUDE MIN	REPORT DATE	POPULAR DAM NAME
MO	20136	LMV	MO	095	04				TARSNEY LAKE DAM	38	57.0	094	12.5	19MAR74	

NAME OF IMPOUNDMENT	REGION	BASIN	RIVER OR STREAM	NEAREST DOWNSTREAM CITY–TOWN–VILLAGE	DIST FROM DAM	POPULATION	TYPE OF DAM
TARSNEY LAKE	10	30	TR WEST FORK	TARSNEY LAKE	001	00000401	RE

YEAR COMP	PURPOSES	HEIGHT STRUCT	HEIGHT HYDR	IMPOUNDING CAPACITIES MAXIMUM	IMPOUNDING CAPACITIES NORMAL	REMARKS	D/S HAZ	CREST LENGTH
1947	P	0030	0030	00000160	00000133	22 24 25 26 27 ESTIMATED		

SPILLWAY TYPE	SPILLWAY WIDTH	SPILLWAY DISCHARGE	VOLUME OF DAM (CY)	POWER CAPACITY INSTALLED (MW)	POWER CAPACITY PROPOSED (MW)	NAVIGATION LOCKS NO	LENGTH (FT)	WIDTH (FT)	LENGTH (FT)	WIDTH (FT)	LENGTH (FT)	WIDTH (FT)	LENGTH (FT)	WIDTH (FT)	OWNER	ENGINEERING BY

CONSTRUCTION BY	REGULATORY AGENCY DESIGN	REGULATORY AGENCY CONSTRUCTION	REGULATORY AGENCY OPERATION	REGULATORY AGENCY MAINTENANCE	INSPECTION BY

INSPECTION DATE	AUTHORITY FOR INSPECTION	REMARKS
		SURFACE 16 ACRES WATERSHED 424 ACRES

MISSOURI CONT'D
JACKSON COUNTY CONT'D

KANSAS CITY DISTRIC

IDENTIFICATION STATE	IDENTIFICATION NUMBER	DIV	PRINCIPAL ST	PRINCIPAL COUNTY	PRINCIPAL CONG DIST	SECONDARY ST	SECONDARY COUNTY	SECONDARY CONG DIST	OFFICIAL DAM NAME	LATITUDE DEG	LATITUDE MIN	LONGITUDE DEG	LONGITUDE MIN	REPORT DATE	POPULAR DAM NAME
MO	20167	LMV	MO	095	05				TERRACE LAKE DAM	38	55.3	094	32.5	09APR74	

NAME OF IMPOUNDMENT	REGION	BASIN	RIVER OR STREAM	NEAREST DOWNSTREAM CITY - TOWN - VILLAGE	DIST FROM DAM	POPULATION	TYPE OF DAM
TERRACE LAKE	10	30	TR BLUE RIVER	KANSAS CITY	001	00510000	RE

YEAR COMP	PURPOSES	HEIGHT STRUCT	HEIGHT HYDR	IMPOUNDING CAPACITIES MAXIMUM	IMPOUNDING CAPACITIES NORMAL	REMARKS	D/S HAZ	CREST LENGTH
1945	P	0025	0025	00000050	00000046	24 25 26 27 ESTIMATED		

SPILLWAY TYPE	SPILLWAY WIDTH	SPILLWAY DISCHARGE	VOLUME OF DAM (CY)	POWER CAPACITY INSTALLED (MW)	POWER CAPACITY PROPOSED (MW)	NAVIGATION LOCKS NO	LENGTH (FT)	WIDTH (FT)	LENGTH (FT)	WIDTH (FT)	LENGTH (FT)	WIDTH (FT)	LENGTH (FT)	WIDTH (FT)	OWNER	ENGINEERING BY
															TERRACE LAKE ASSOCATION	

CONSTRUCTION BY	REGULATORY AGENCY DESIGN	REGULATORY AGENCY CONSTRUCTION	REGULATORY AGENCY OPERATION	REGULATORY AGENCY MAINTENANCE	INSPECTION BY

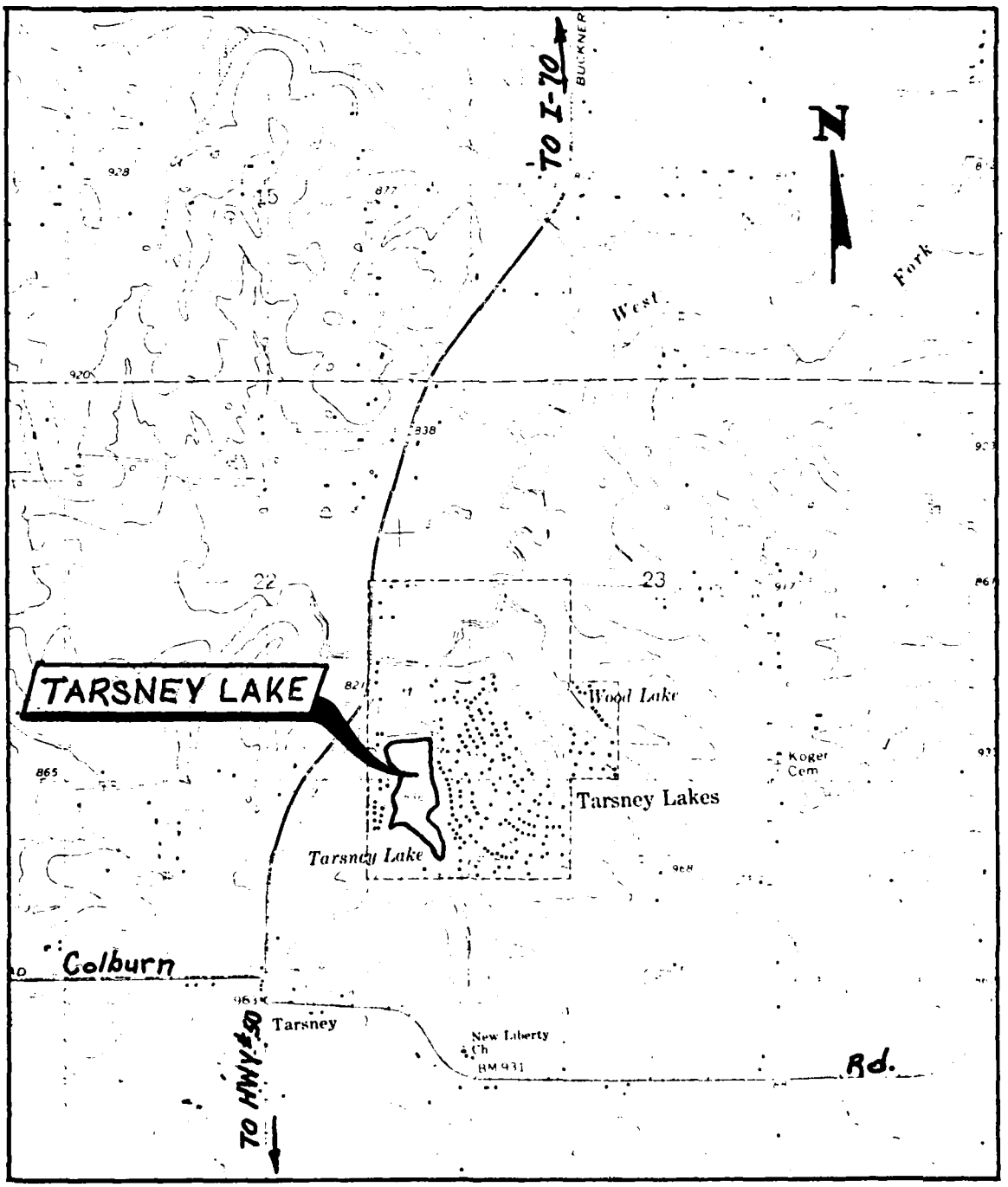
INSPECTION DATE	AUTHORITY FOR INSPECTION	REMARKS
		SURFACE 6 ACRES WATERSHED 50 ACRES

U. S. ARMY CORPS OF ENGINEERS - KANSAS CITY DISTRICT

Comp. By ____ Date 2-3-76 Project TARSNEY LAKE Sheet 1 of 1

Chkd. By ____ Date ____ Subject DAM NO. -201036 Sheet ____ of ____

Tarsney Lakes Missouri Quadrangle-1965 Revised 1975

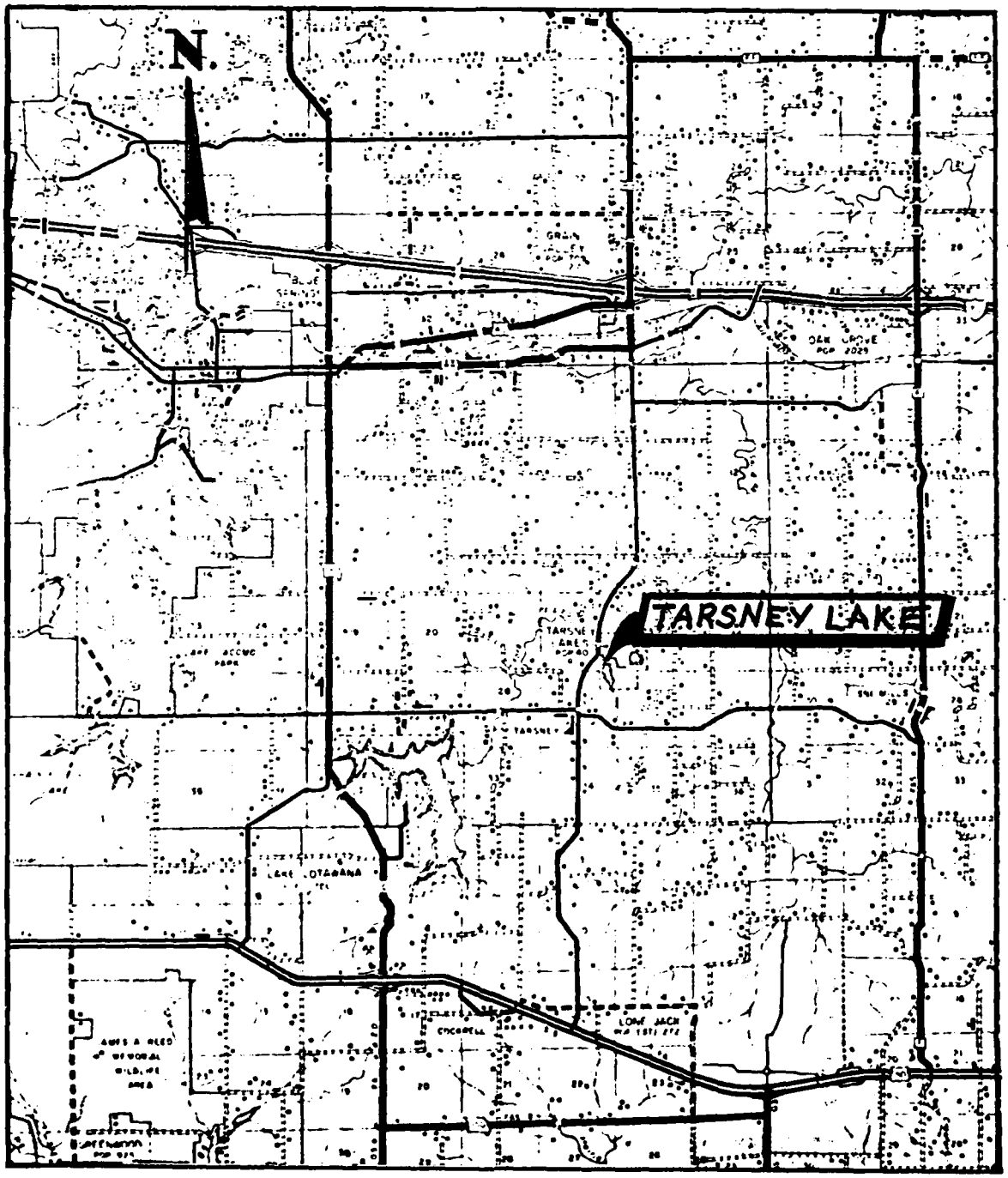


U. S. ARMY CORPS OF ENGINEERS - KANSAS CITY DISTRICT

Comp. By W.W.B Date 8-78 Project TARSNEY LAKES Sheet 1 of 1

Chkd. By ____ Date ____ Subject DAM-MO-201036 Sheet ____ of ____

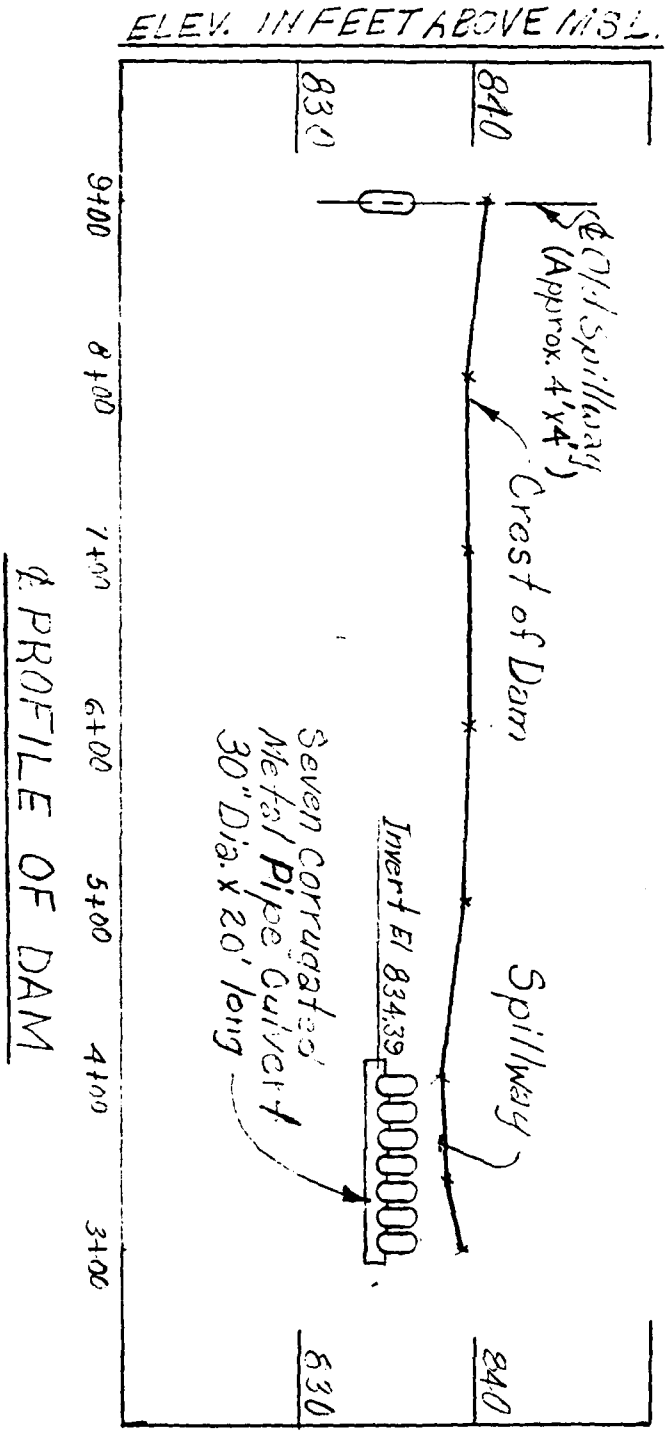
Jackson County, Missouri



U. S. ARMY CORPS OF ENGINEERS - KANSAS CITY DISTRICT

Comp. By ____ Date 2-3-7[illegible] Project TARSNEY LAKE Sheet 1 of 1

Chkd. By ____ Date ____ Subject DAM-MO. 20136 Sheet ____ of ____



℄ PROFILE OF DAM

Photography Log

National Dam Inspection Program

Tarsney Lake
Jackson County, Missouri

Photo No. 1 - Downstream slope of the dam from the right spillway area
2 - Crest of the dam looking toward left abutment
3 - Solution channel from the crest (behind outlet headwall)
4 - Upstream slope of the embankment
5 - Downstream slope
6 - Submerged toe condition of downstream slope
7 - Submerged toe condition of downstream slope
8 - Submerged toe condition of downstream slope
9 - Submerged toe condition of downstream slope
10 - Eroded outlet channel
11 - Eroded outlet channel
12 - Right abutment spillway - outlet side
13 - Right abutment spillway - outlet side
14 - Right abutment spillway - outlet side
15 - Right abutment spillway - outlet side
16 - Intake side of the right abutment spillway

Photo 2

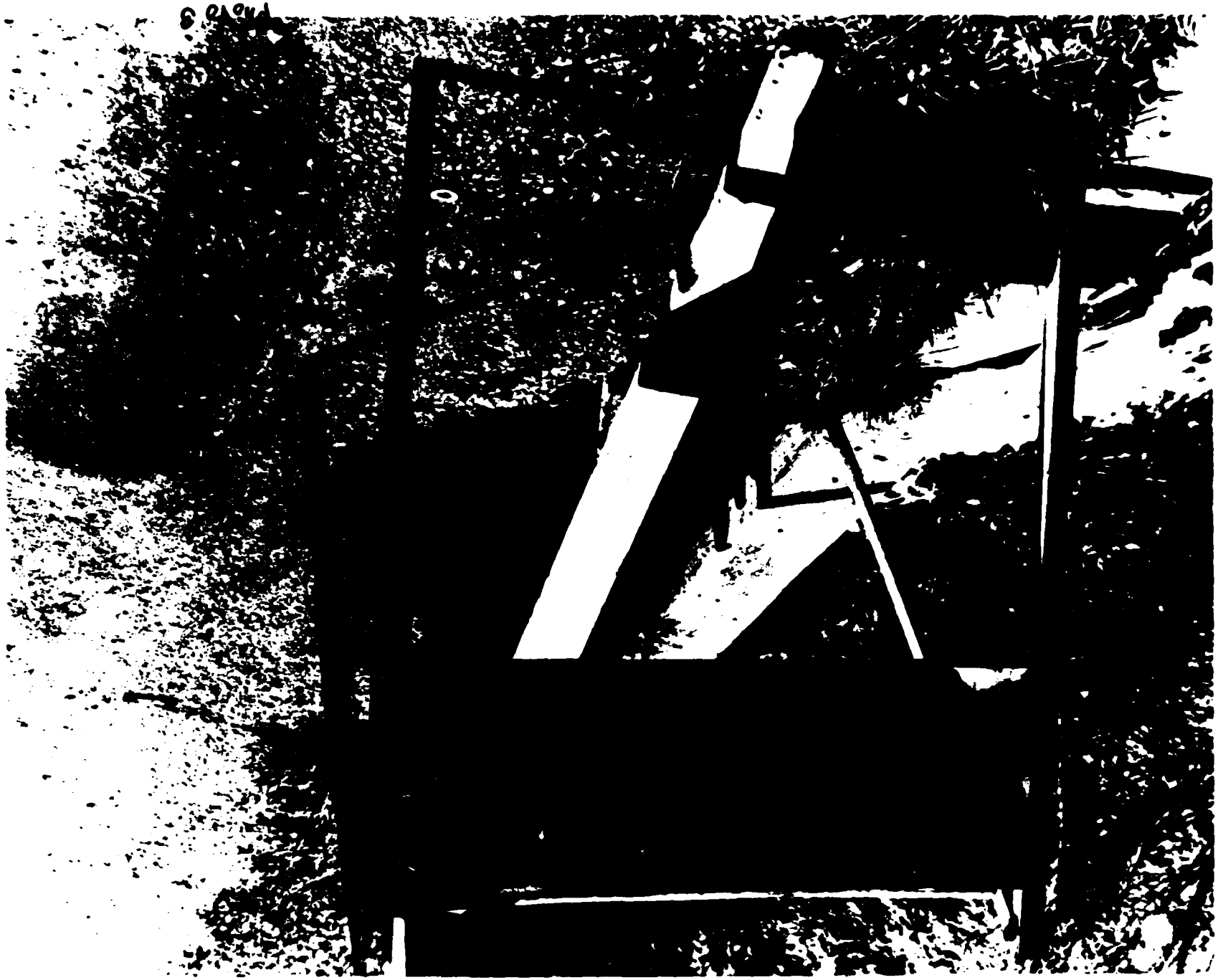


Photo 5

Photo

photo 7


Photo

photo 9

photo 10

Photo 11

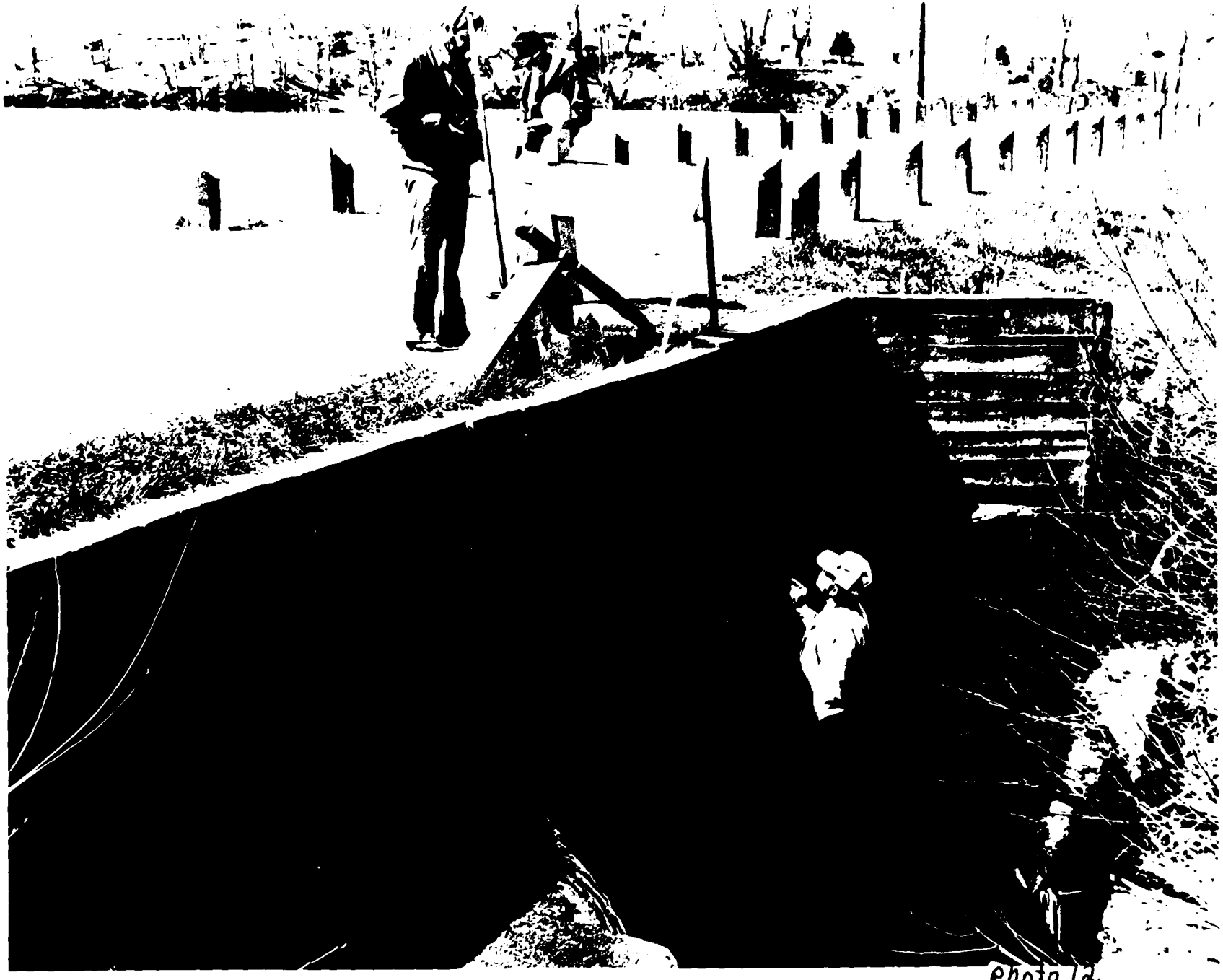


photo 12

photo 13

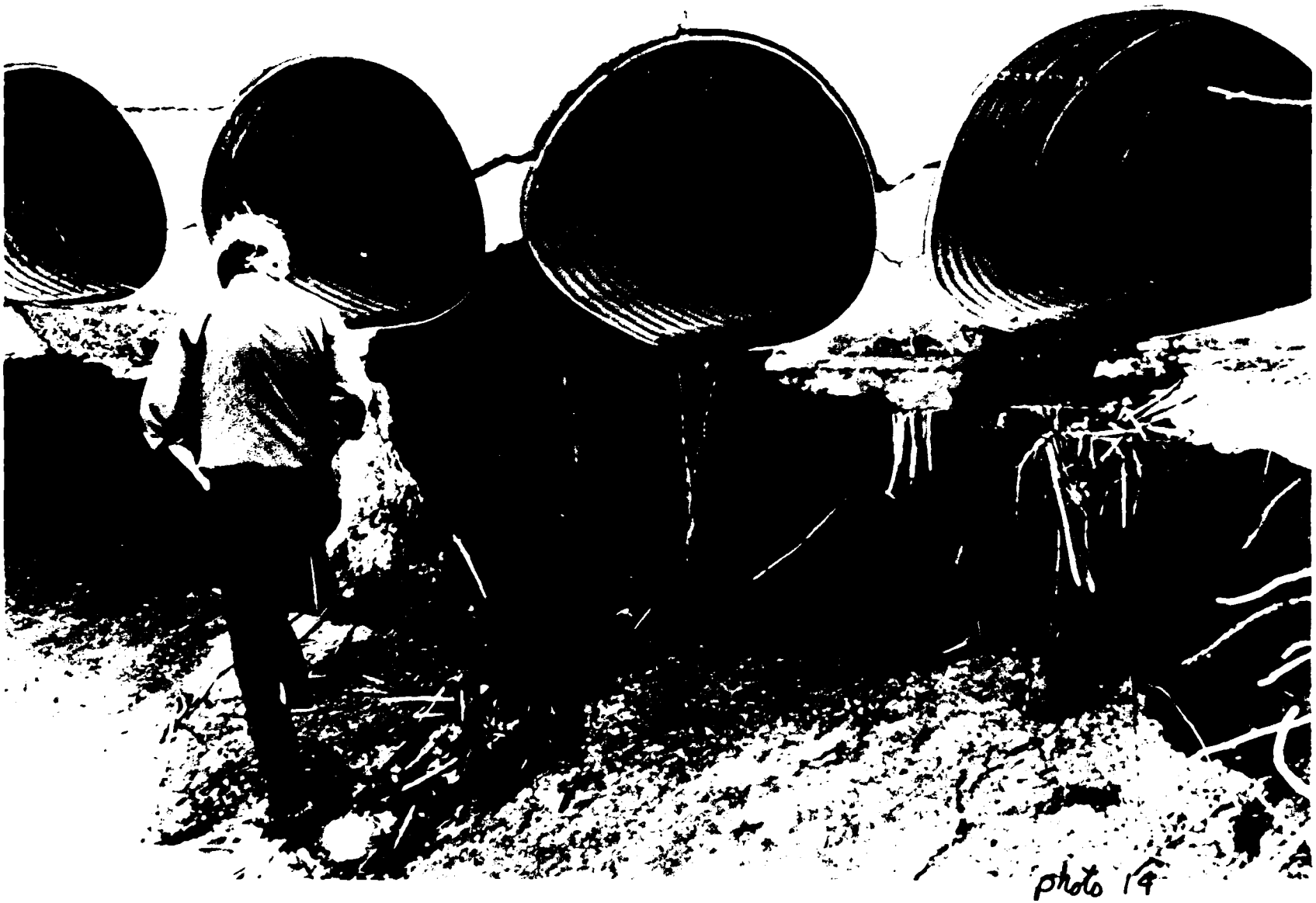


photo 14

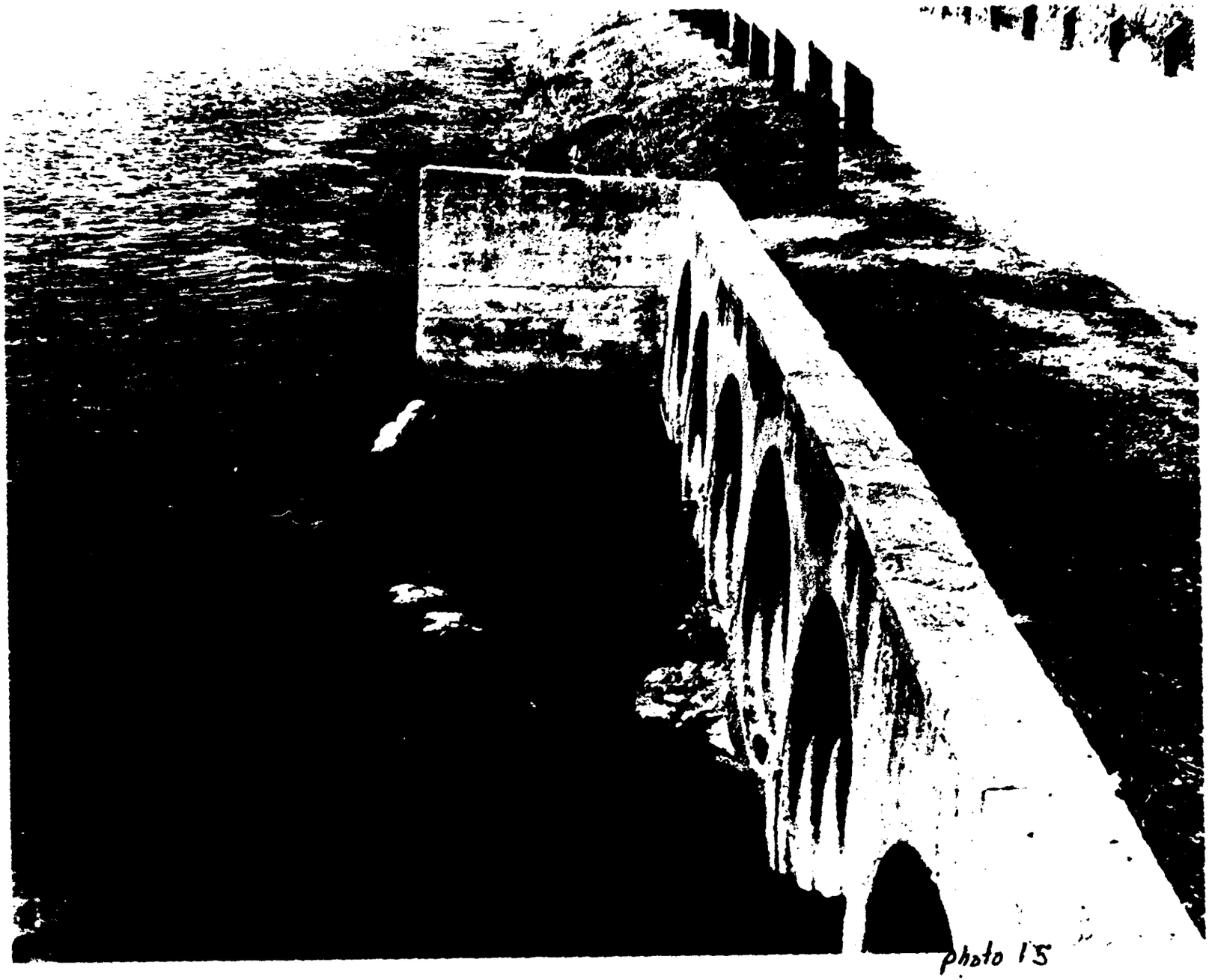


photo 15

photo16